AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

DECEMBER 1, 1957

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More than 64 Lb of Aluminum Used in the Edsel Car

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A CHILTON PUBLICATION

Two case histories

How 2 companies improved production by changing to

STANICUT Cutting Oils

Here are reports on two companies that have recorded (1) increases in production (2) better machine performance (3) longer tool life (4) money saved by switching to a STANICUT *Cutting Oil suited to their operations. You can get similar results.*

Operator George Laverdiere and Standard Oil lubrication engineer, Leland J. Loomis, examine piece just off Cincinnati centerless grinder. Lee Loomis is another man who knows how to advise on metalworking problems. Lee has had ten years' experience in such work, has an engineering degree from Tri-State College and has graduated from the Standard Oil Company's Sales Engineering School.

G. A. Brevik Manufacturing Company uses STANICUT Oil 137 BCS

G. A. Brevik Manufacturing Company, Prescott, Michigan, is the largest producer of carburetor needle valves. The company was blending its cutting fluid from four different oils. Still they experienced tool breakage and ring formation on the surface of the stainless steel they were machining. Then one machine was converted to STANICUT Oil 137 BCS to test the oil's suitability for this operation. Soon all machines were converted.

Production increased 25% because of the improved performance of the machine tool. Cutting oil inventories have been reduced from four different oils to one. Tool life has been extended. There is no variation in fluids as there was when four oils were being blended, and there is no messy blending operation.

STANICUT Oil 137 BCS is ideally suited for severe, high speed machining.

Standard Oil industrial lubrication specialist, Ray Wells, and Stuart Bergsma, G. A. Brevik manager, inspect carburetor needle valve. Ray recommended plant's switch to STANICUT Oil 137 BCS. He is well qualified to make such recommendations. Ray is a graduate of the Illinois Institute of Technology with a degree in engineering, and he has completed the Standard Oil Sales Engineering School. He has been an industrial lubrication specialist at Standard for six years.

Dearborn Centerless Grinding Co. uses STANICUT Oil 126 BCS

Difficult-to-grind stainless steel was the problem at Dearborn Centerless Grinding Company. Wheel loading and wheel break-down were such that soluble type oils weren't satisfactory. For this reason, Dearborn began using STANICUT Oil 126 BCS.

Company management found it secured these six important benefits by changing to STANICUT Oil 126 BCS in grinding operation:

1. Better finishes.
2. More pieces obtained per wheel dress.
3. Superior wheel life obtained on profile jobs.
4. Harder wheels could be used.
5. Finer grit wheels could be used.
6. More stock per pass could be removed.

Get more data on STANICUT Cutting Oils from your Standard Oil industrial lubrication specialist. One of these men is nearby in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

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through dependable heavy-duty

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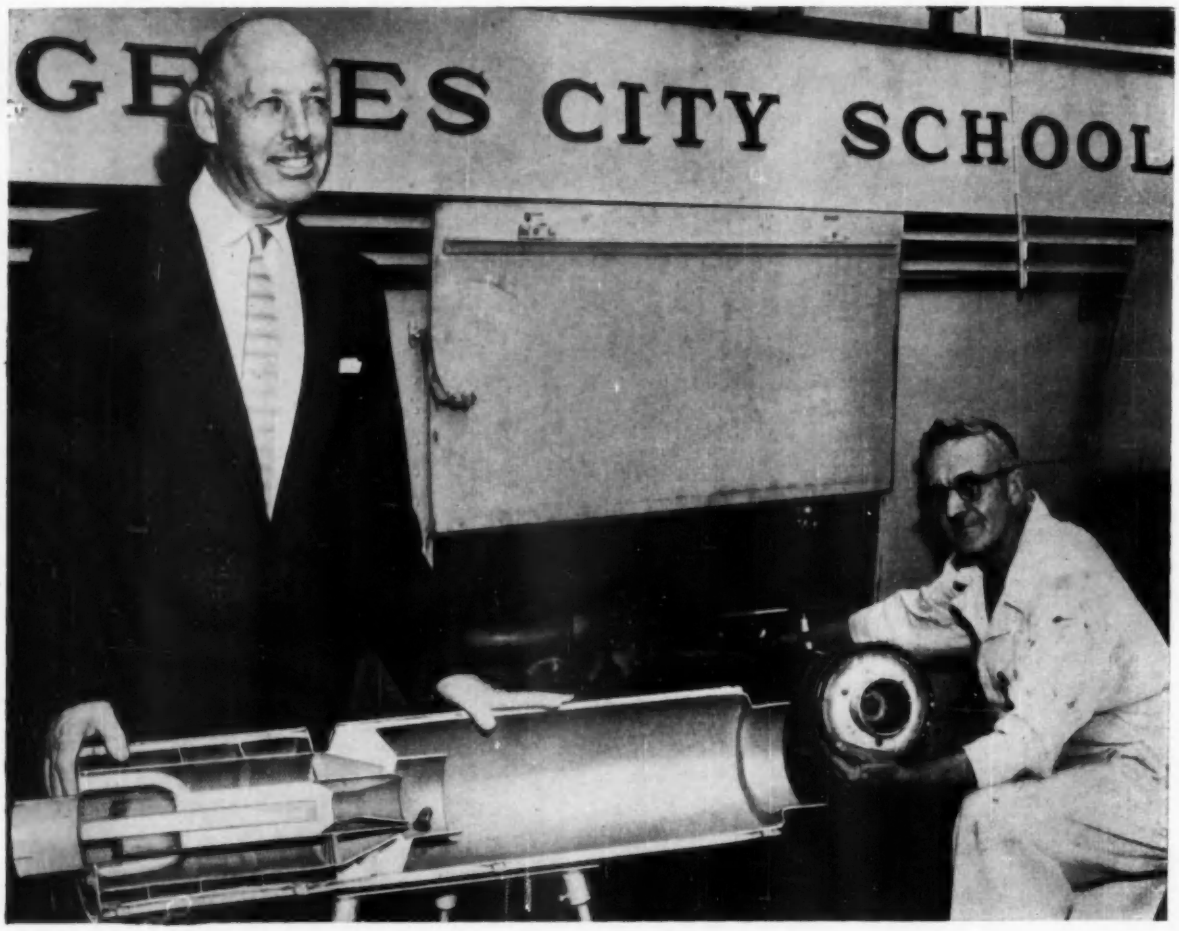

New anti-smog muffler on a Los Angeles bus. Unit operates on the principle of self-contained combustion of unburned fuel carryover in exhaust. The high heat and oxidation resistance of nickel-containing stainless steel helped make the design practical. Sold by Clayton Clearair Muffler Company, 403 West 8th St., Los Angeles 14, Calif.

New anti-smog muffler made of Type 321 Stainless to withstand 1300°F.

The Clearair Muffler is actually a muffler with a 1300°F. afterburner. Selecting materials posed a two-fold problem.

First, all inner parts of the unit – tubes, burner cone, inner shell and the like – needed high heat and oxidation resistance for the 1300°F. temperatures developed in the afterburner.

Second, because most of the components were sheet-metal stampings . . . or formed and welded sub-assemblies, the designers needed a material that formed easily . . . welded easily.

Type 321, a stabilized stainless steel, does the job on both counts.

Type 321 austenitic nickel-chromium stainless steel provides the necessary heat and oxidation resistance for parts subject to 1300°F. temperatures. It also provides high resistance to corrosive gases.

Type 321 solves the production problems too. It forms easily. It welds easily. Spot, seam and Heliarc techniques are all used successfully by Clayton Manufacturing Co. in fabricating the unit.

If you have a difficult design problem, chances are one of many nickel-containing stainless steels is the answer for you too. For detailed information on how to make the right selection, send for "Stainless Steel In Product Design." It covers properties, forms available, applications and other valuable data.

The INTERNATIONAL NICKEL COMPANY, Inc.

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

DECEMBER 1, 1957 — VOL. 117, NO. 11

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NBP National Business Publications, Inc.

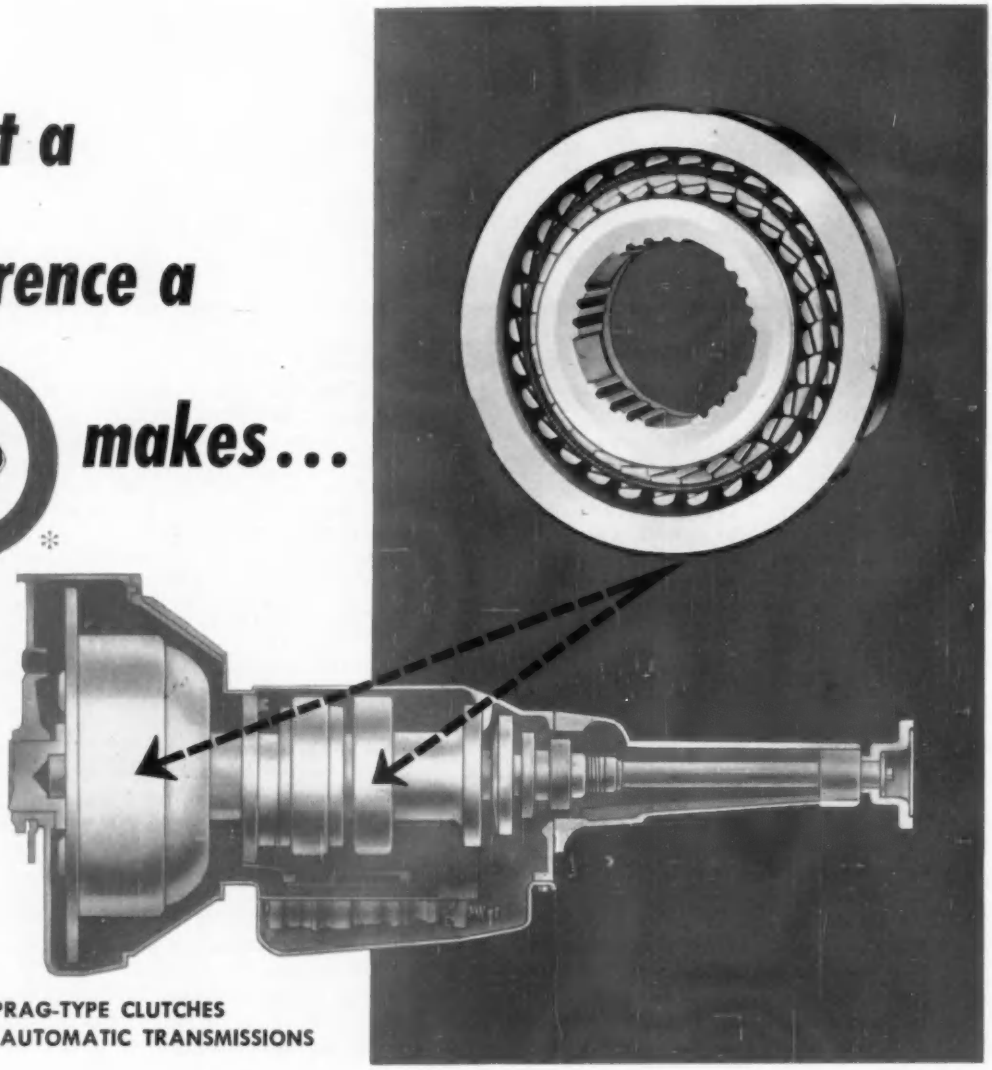
ABC Audit Bureau of Circulations

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Company, Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: To manufacturers in and suppliers to the automotive industries in the United States and Possessions, $2.00 per year; $3.00 for 2 years. All Others, $10.00 per year. Single copies, 50¢. Statistical Issue, $1.00.

What a difference a D makes...*



IN SPRAG-TYPE CLUTCHES FOR AUTOMATIC TRANSMISSIONS

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In addition, D-shaped sprags are self-spacing, act independently and share the load equally. Moreover they allow insertion of a *full complement* of sprags in far less space. So, more engine torque can be transmitted per cubic inch of clutch displacement with Formsprag than by any other type of over-running clutch.

*In addition to the D-shape, Formsprag employs other sprags such as the "double D" used in special high speed applications.

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58-P

Great advances in design . . .

NEED THE ADVANCEMENT IN WEAR RESISTANCE PROVIDED BY FLAME-PLATING BY LINDE

Lockheed's F-104A Starfighter, newest weapon of the Air Force, is the most advanced airplane of its type. To give them the greatest possible resistance to extreme conditions, bearing surfaces *(arrows)* of hot air valves used in the F-104A are Flame-Plated with tungsten carbide. Flame-Plating provides the wear-resistant coating needed to withstand the high unit loading and temperature extremes jet plane parts undergo.

Stratospheric altitudes . . . supersonic speeds . . . extreme temperatures subject jet plane parts to almost incredible conditions of heat and abrasion. To assure perfect operation in all circumstances, bearings of hot air valves in the Starfighter are Flame-Plated. A tungsten carbide coating, applied by LINDE's unique method, is the only material tried that successfully eliminated galling and provided a low coefficient of friction over the required service life of the part. With the part Flame-Plated, practically no wear occurred. This LINDE process is now a regular production procedure.

Flame-Plating is LINDE's special process for protecting metal parts from wear, abrasion, and fretting corrosion. Tiny particles of tungsten carbide or aluminum oxide are literally *blasted* onto the metal surface. Since the temperature of the part being coated seldom exceeds 400 degrees F., there is little or no risk of changes in its shape or metallurgical properties. Flame-Plated coatings can be applied from .002 to .010 inches thick, and used as coated or finished to 0.5 microinches rms. Practically all metals can be Flame-Plated—aluminum, magnesium, molybdenum, titanium as well as copper and steel.

Your own design may be improved by Flame-Plating. Find out how, by writing for a copy of the booklet "Flame-Plating," F8065. Address Flame-Plating, Dept. H-13, LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.

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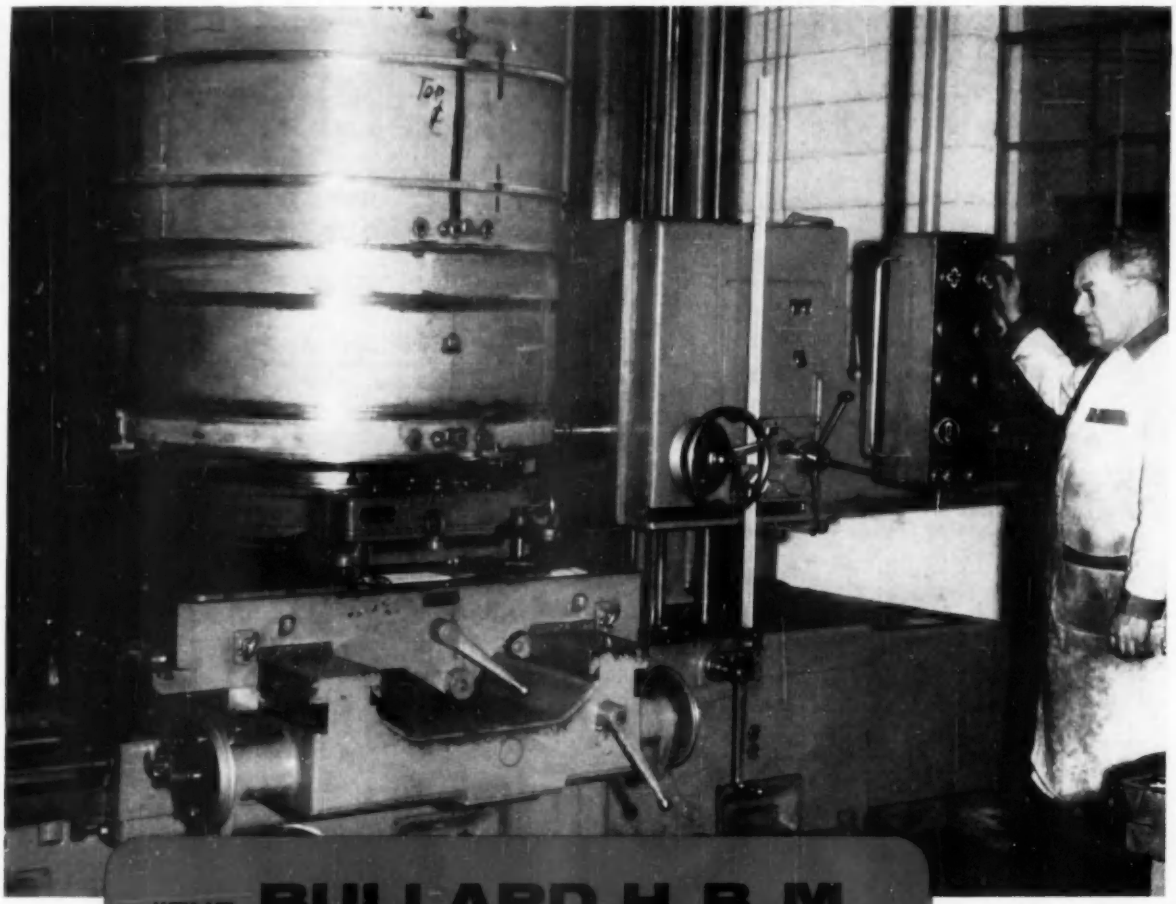

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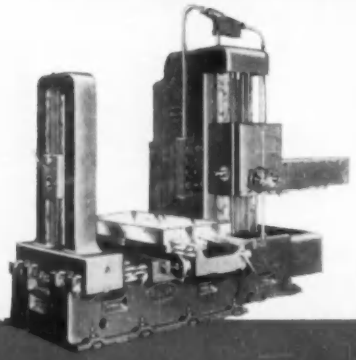
"And yet it costs no more than others. Our accuracy is much improved . . . and production has increased 20%—and business is up by at least 20% . . . these factors mean higher profits. The Bullard H. B. M., Model 75 will pay for itself many times over."



Bullard 3" Horizontal Boring, Milling & Drilling Machine, Model 75 one of four models in the complete line.

This statement by the owner of a leading job shop in the Detroit area is typical of the benefits derived when modern Bullard Machine Tools are applied to machining methods and problems.

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to cut costs when cutting metal . . . buy BULLARD

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When the performance of your product can be improved with vibration control or with bonded-rubber components, you can rely on LORD for the most effective solution to your problem.

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Third, LORD has extensive research and development facilities in addition to the Engineering Division and the LORD Field Engineers—all available and geared for immediate and effective action in solving product problems involving vibration control or bonded-rubber products.

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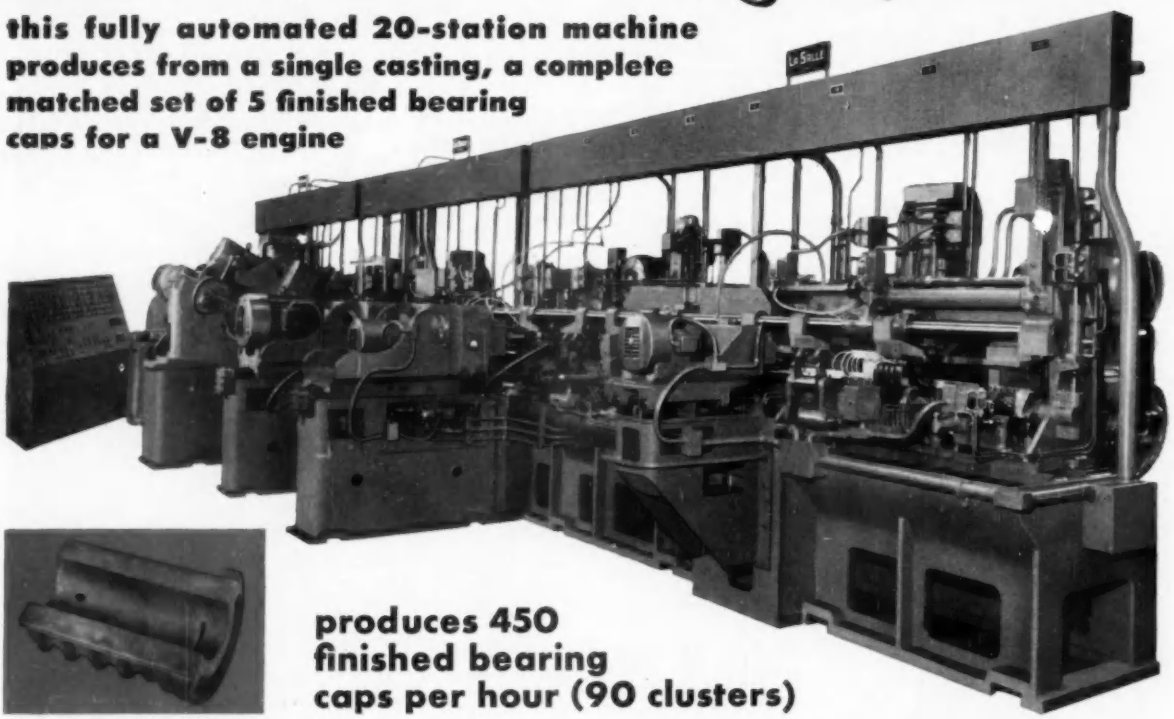
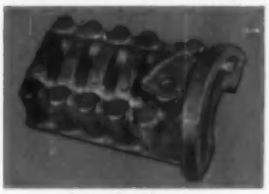
La Salle bearing-cap-amatic

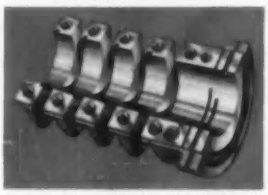
this fully automated 20-station machine produces from a single casting, a complete matched set of 5 finished bearing caps for a V-8 engine



Joint Face Side (Rough)



Rough Cluster



Joint Face Side (Finished)

Finished Cluster

produces 450 finished bearing caps per hour (90 clusters)

1. The bearing cap cluster is shuttled into the load station, then rotated 90° so that the joint face is in a vertical plane. The part is then shuttled through the machine using one edge of the channel fit for vertical location and the joint face for in and out location.
2. End wise location is taken with a vee block on bearing cap No. 3—Then the part is clamped.
   Right hand operation is to mill bearing cap cluster to length—Both ends. Left hand operation—drill (4) ½ Dia. Holes through.
3. Clamp: Right hand operation—Probe 4 drilled holes.
   Left hand operation—Idle.
4. Locate from drilled hole—bearing cap No. 5 and clamp.
   Right hand operation—Mill oil pump Pad No. 5 Vertical.
   Left hand operation—Ream 2 holes bearing cap No. 3 and drill 4 holes.
5. Locate from reamed hole in bearing cap No. 3 and clamp.
   Right hand operation—Idle.
   Left hand operation—Drill 4 holes through and chamfer two holes in No. 5 bearing cap.
6. Clamp: Right hand operation—Probe 9 holes.
   Left hand operation—Idle.
7. Locate from hole in bearing cap No. 5 and clamp.
   Right hand operation—Drill one angular hole half way in oil pump pad bearing cap No. 5.
   Left hand operation—Chamfer 9 holes.
8. Locate from reamed hole bearing cap No. 3 and clamp.
   Right hand operation—Drill one angular hole to depth in oil pump pad bearing cap No. 5.
   Left hand operation—Ream 8 holes.
9. Clamp: Right hand operation—Idle.
   Left hand operation—Idle.
10. Locate from reamed hole in bearing cap No. 3 and clamp.
    Right hand operation—Spot-face 6 bosses.
    Left hand operation—Idle.
11. Locate from reamed hole in bearing cap No. 3 and clamp.
    Right hand operation—Spot-face 4 bosses.
    Left hand operation—Mill one 2" dia. by .120 slot in bearing cap No. 5.
12. Clamp: Right hand operation—Idle.
    Left hand operation—Idle.
13. Locate from reamed hole in bearing cap No. 3 and clamp.
    Right hand operation—Drill and counter-sink 2 holes in oil pump pad—counterbore oil pump shaft hole.
    Left hand operation—Idle.
14. Locate from reamed hole in bearing cap No. 3 and clamp.
    Right hand operation—Probe and blow out 2 holes in oil pump pad—Combination ream oil pump shaft hole.
    Left hand operation—Mill one .120 slot and one .190 slot in bearing cap No. 5.
15. Clamp: Right hand operation—Idle.
    Left hand operation—Idle.
16. Locate from reamed hole in bearing cap No. 3 and clamp.
    Right hand operation—Idle.
    Left hand operation—Mill 5 anchor slots.
17. Clamp: Right hand operation—Idle.
    Left hand operation—Idle.
18. Locate from reamed hole in bearing cap No. 3 and clamp.
    Right hand operation—Tap 2 holes in oil pump pad.
    Left hand operation—Idle.
19. Locate from reamed hole in bearing cap No. 3 and clamp each of the 5 bearing caps independently.
    Right hand operation—Idle.
    Left hand operation—Mill 4 slots through bearing cap cluster, which divides cluster into 5 separate bearing caps. (Shuttle 5 separate bearing caps to station No. 20 —).
20. Unload 5 separate bearing caps, maintaining separation.

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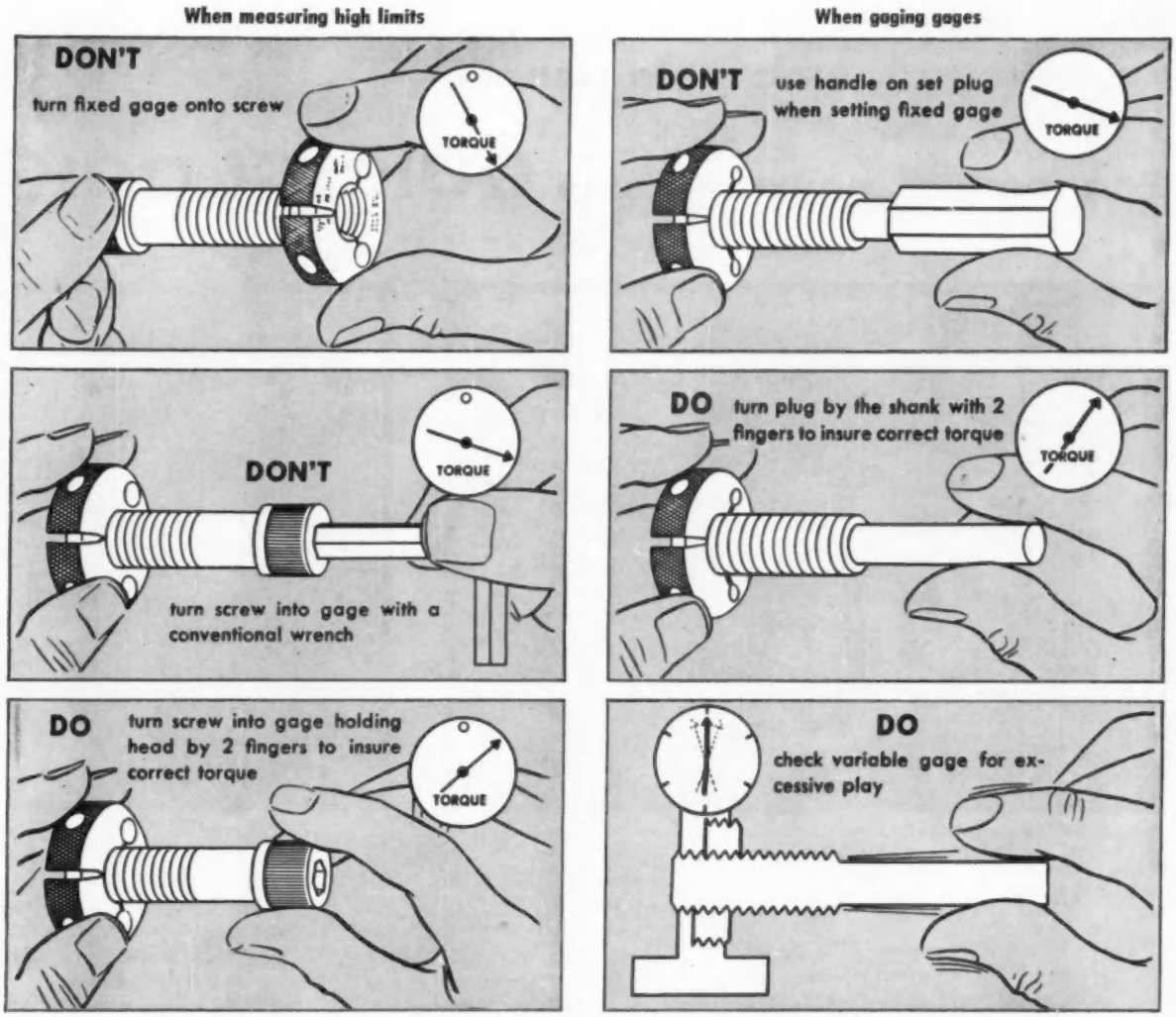

These illustrations from new SPS booklet show some of the do's and don'ts of gaging precision threads.

3A threads: what they are; how to gage them — new SPS booklet tells all

Threads made to Class 3A fit are the most precise in general use in industry. But you do not always get the 3A precision you specify. Because of many different gaging techniques that yield varying results, screws with threads well outside the Class 3A tolerance limits often pass inspection.

SPS has prepared a new booklet on this subject. It explains clearly what Class 3A threads are and the pros and cons involved in the widely varying gaging techniques in use today. It reviews the gaging of high and low limits of 3A threads, sampling techniques, and even the methods of gaging gages.

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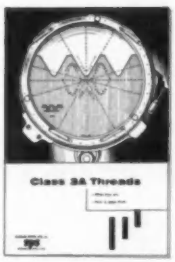

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Fastening of removable panels

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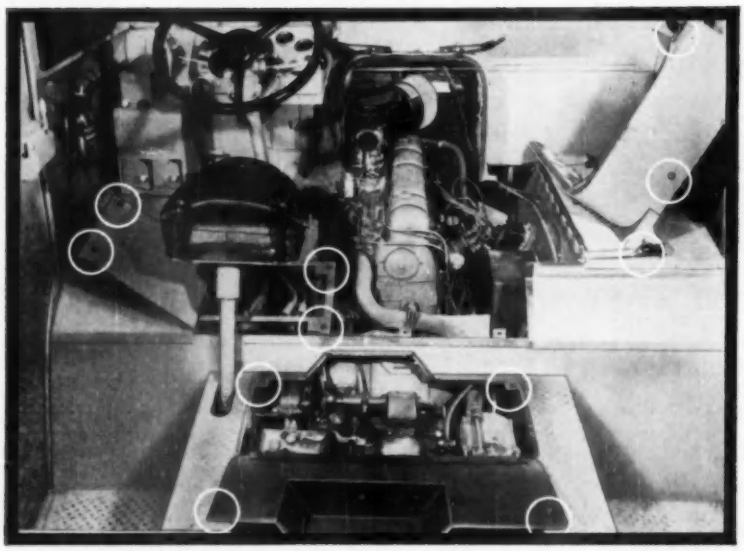
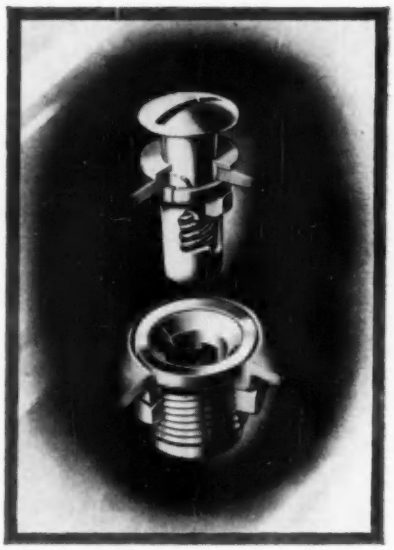
Economical, easy-to-install QUICK-LOCK





Photograph courtesy Divco-Wayne Corporation, Detroit, Michigan

In Divco delivery trucks,

QUICK-LOCK guarantees

trouble-free opening and closing

of cowlings and access panels

Among the outstanding design features which have contributed to the success of Divco door-to-door delivery vehicles is the sure, quick closing and opening of cowlings and panels. To provide easy access to engine and transmission, Divco specifies Simmons QUICK-LOCK on demountable covers of various shapes and thicknesses.

QUICK-LOCK has unlimited applications in the electrical and electronic, automotive, appliance, aircraft, and other manufacturing fields. *Here's why* millions are in use today on many types of valuable equipment cases, weather-tight lighting units, voltage regulators, engine panels, and access panels and doors:

- A 90-deg. turn locks and unlocks QUICK-LOCK. No special tools needed.
- Stud is self-aligning; speeds up mounting and demounting of removable panels.
- When unlocked, stud is self-ejecting—easily checked by visual inspection.
- Various stud and receptacle types...oval, flush, and wing-head studs; easily installed plate and screw-type receptacles.
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- Design features allow for curved sheet installation, and even slight misalignment of holes.
- *Maximum economy in production* assured by single hole mounting of screw-type receptacle.

Send today for the Simmons Catalog

Where does QUICK-LOCK belong in your design? For complete information and specifications, write for the Simmons Catalog today. Samples and free engineering service are available upon request.

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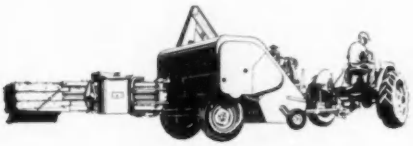
QUICK-LOCK • SPRING-LOCK • ROTO-LOCK • LINK-LOCK • DUAL-LOCK

2, 4, 6, 8, or as many as 16 holes



IN A BALER FRAME . . . AT ONCE . . . WITH A SIMPLE "HY-POWER" SET-UP

Here's a "Hy-Power" machine that punches as many as 16 holes *at once* in the structural steel sections that make up the sturdy frame of the world-famous New Holland Machine Company hay baler.

This simple, versatile and inexpensive unit—designed by New Holland engineers—makes possible economical, precision, multiple-hole punching of even short runs. Individual cylinders are easily and quickly positioned to meet different job specifications . . . then connected to convenient openings in the pressure and return lines.

The sixteen 5000 p.s.i. "Hy-Power" Cylinders are powered by two exclusive Hannifin "Hy-Power" Hydraulic Pressure Generators . . . compact units including motor, pump, oil reservoir, control valves and high pressure intensifier. *This is "Hy-Power" Hydraulics!*

OUR BULLETIN 150 TELLS
the complete story of Hannifin "Hy-Power" Hydraulics. Your copy sent on request.

WHAT DOES THIS SUGGEST TO YOU?

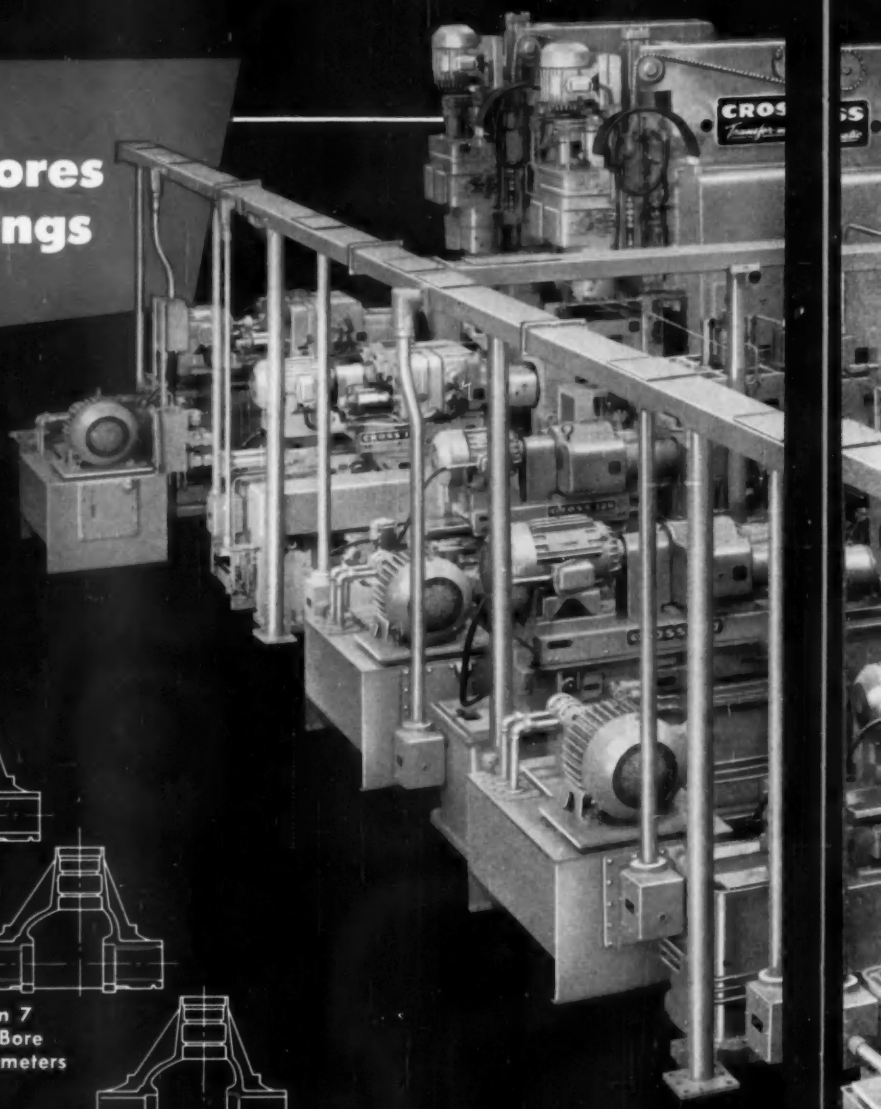
Proved in many fields, "Hy-Power" Hydraulics can provide better, faster production and performance for one-of-a-kind specials like this or for the machines you may build repetitively. Why not investigate this equipment that permits applying forces up to 100 tons...in any direction...simultaneously? Why not learn all about the nearly 100% salvageability of "Hy-Power" components when set-ups must be changed? A Hannifin representative will explain how you can utilize "Hy-Power" for punching, riveting, staking, bending or crimping operations. Hannifin Company, 543 S. Wolf Road, Des Plaines, Ill.

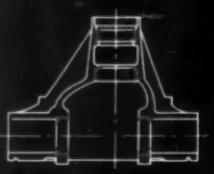
do ALL you CAN do... with

HANNIFIN

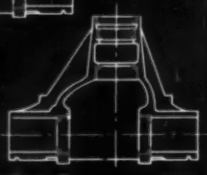
Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

Precision Bores Axle Housings

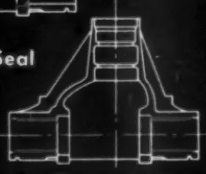




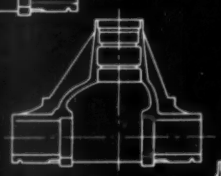
Station 11
Finish Bore
Four Bearing Seats



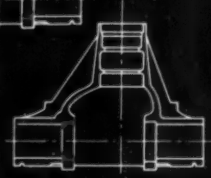
Station 9
Semi-Finish Bore Oil Seal
and Bearing Seats



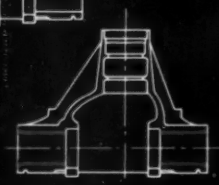
Station 7
Finish Bore
Tube Diameters



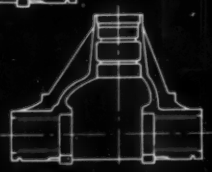
Station 5
Rough Back-bore
Right Side



Station 4
Rough Back-bore
Left Side

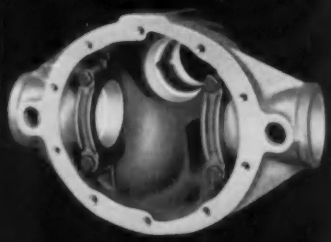


Station 3
Semi-Finish Bore
Tube Diameters

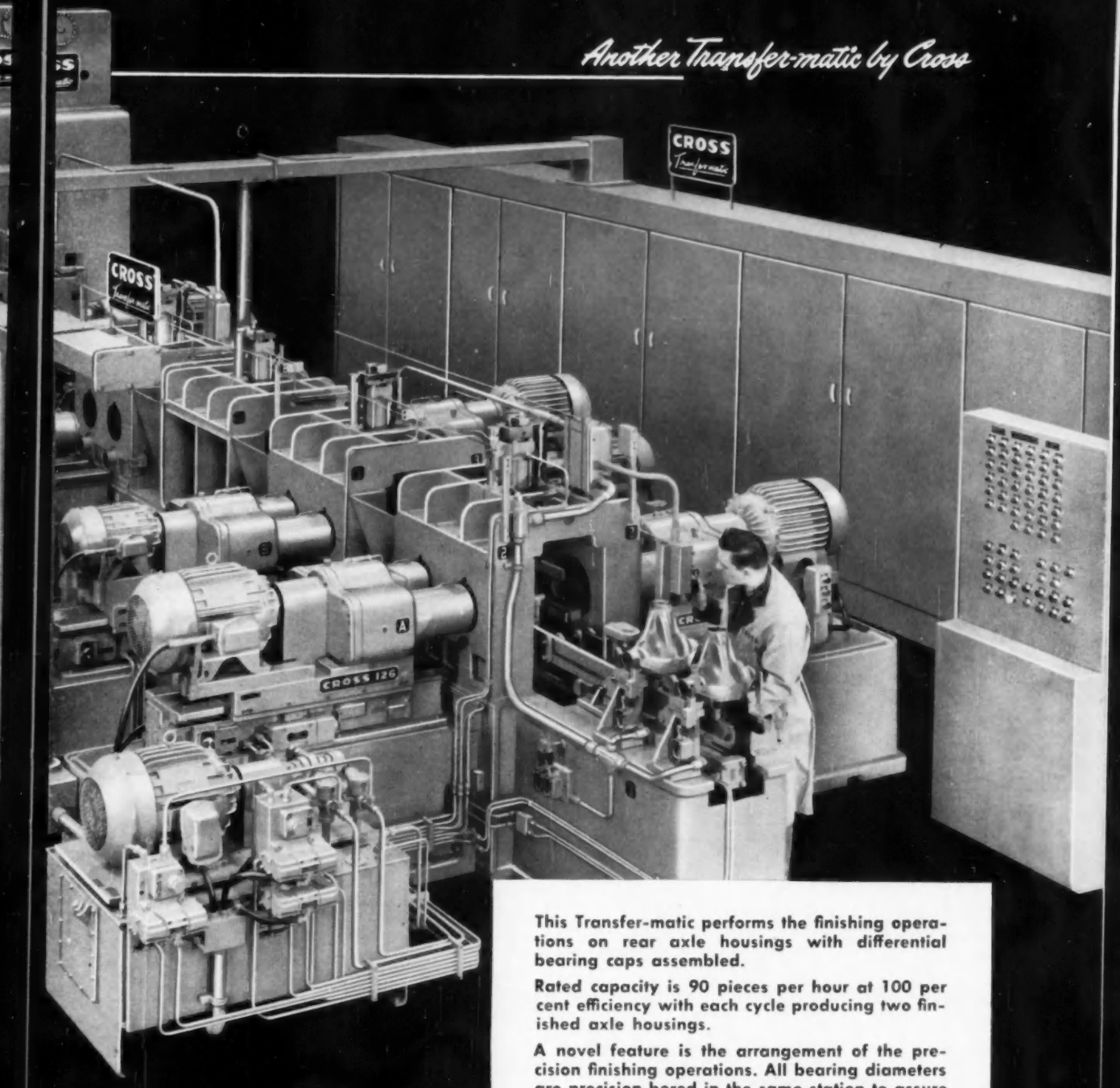


Station 2
Rough Bore
Tube Diameters

Station 1
Load Two Parts



Another Transfer-matic by Cross



This Transfer-matic performs the finishing operations on rear axle housings with differential bearing caps assembled.

Rated capacity is 90 pieces per hour at 100 per cent efficiency with each cycle producing two finished axle housings.

A novel feature is the arrangement of the precision finishing operations. All bearing diameters are precision bored in the same station to assure precise gear centers. The vertical boring unit finishes first one and then the other of the two pinion shaft bearing diameters. In the same station, opposed horizontal units back-bore the differential bearing diameters. Perfect concentricity and squareness of the shoulders are obtained between the two pinion bearing seats since both are bored with the same spindle.

Other features are complete interchangeability of all standard and special parts for easy maintenance, construction to JIC standards, hardened and ground ways, hydraulic feed and rapid traverse and automatic lubrication.

Established 1898

THE CROSS CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

How to bring a high-flying

New Goodyear cushioning medium makes the impossible practical—provides new R-O-O-M for comfort!

NEVER SAY "IT CAN'T BE DONE"—unless you mean it can't be done by the old, conventional methods.

For when you employ AIRFOAM as a *designing aid* and *basic component* (rather than just as an alternate cushioning) you open new vistas of space engineering.

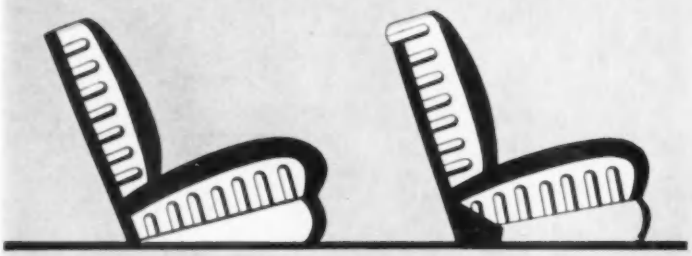
You see, full-depth AIRFOAM, molded to your specifications, eliminates need for bulky elements—fits *more* good style and *more* luxurious comfort into *less* interior cubage.

Once you turn your back on the old no-can-do—and share your seating problems with Airfoam Development Engineers—you'll find your highest-flying ideas come down to earth without losing a single feather!

We've got a lot of answers here at Development. Maybe some fit your favorite questions. Just contact Goodyear, Engineered Products Dept., Akron 16, Ohio.

CROSS SECTION COMPARES OLD AND NEW SEAT CONSTRUCTION:

Solid areas show space saved by full-volume AIRFOAM *seat-units.*



(Even though AIRFOAM *seat is one inch lower—eye level remains the same)*

Isn't it difficult and costly to keep this piping uniform?

NO. It's molded-to-shape AIRFOAM—can be quickly duplicated everytime.

Don't individual seat bases cost plenty?

Not when this simple. The AIRFOAM just makes them look intricate.

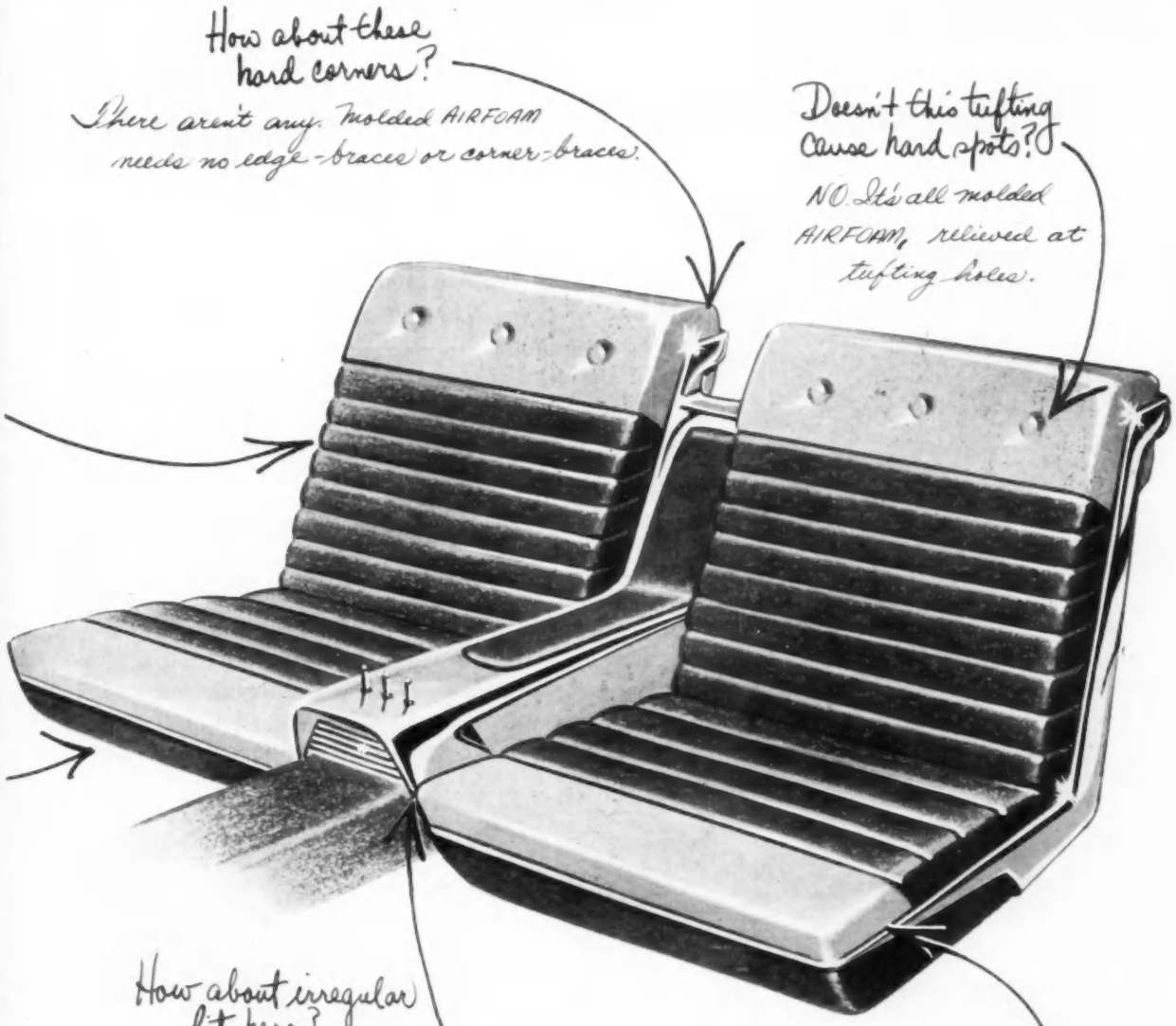
Airfoam

MADE ONLY BY GOODYEAR

THE WORLD'S FINEST, MOST MODERN CUSHIONING

Airfoam—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

seat idea down to earth


How about these hard corners?
There aren't any. Molded AIRFOAM needs no edge-braces or corner-braces.
Doesn't this tufting cause hard spots?
NO. It's all molded AIRFOAM, relieved at tufting holes.
How about irregular fit, here?
NO problem. Full-volume AIRFOAM tailors this point perfectly.
How can you build comfort into such a low seat?
Let full-depth AIRFOAM do all the cushioning work. Remember—it's an entirely new cushioning medium!

International

Diamond T

The BIG JOBS count on Thompson linkage, too

Caterpillar

Mack

STEERING linkage, engineered and manufactured by Thompson Products' Michigan Division, isn't only used on leading passenger cars. Heavy duty vehicle manufacturers count on Thompson too, as you can see from some of the big jobs above. All of them are equipped with Thompson chassis parts.

Thompson is continually being called upon by the automobile, truck, farm machinery and off-the-road vehicle manufacturers to come up with new ideas and new manufacturing. Why don't you call or write Thompson's Michigan Division now for help with your problems. The address is 34201 Van Dyke, Warren, Michigan; the telephone number Jefferson 9-5500.

Four Wheel Drive

Euclid

You can count on

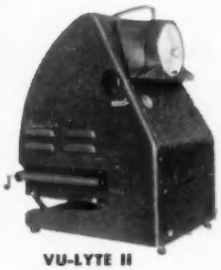
Thompson Products

Michigan Division: Warren and Portland

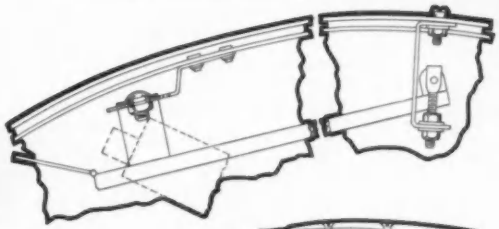
Waldes Truarc Rings cut assembly costs, improve performance of precision photo-optics equipment

Charles Beseler Co., E. Orange, N. J. uses Waldes Truarc Retaining Rings in 3 applications shown.

REFLECTING MIRROR ASSEMBLY IN OPAQUE PROJECTOR

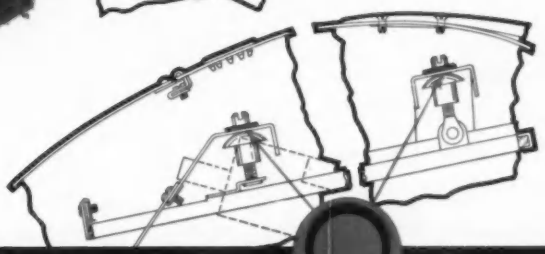


VU-LYTE II PROJECTOR



BEFORE

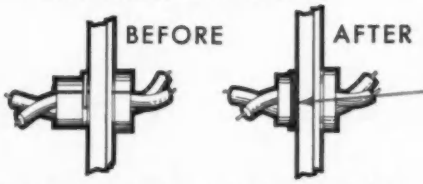
"The front surface mirror is the most precise optical element in a properly-functioning opaque projector," Beseler writes. "Previously we used this extremely cumbersome means of holding the mirror in position. As mirror adjustments are always required and the mirror is extremely delicate, our spoilage was terrific."



AFTER

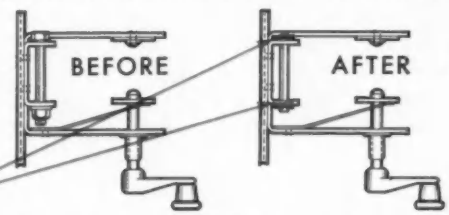
"Two Truarc Series 5100 Rings made possible complete redesign of the mirror assembly. Now mirrors can be adjusted from *outside* the projector. Rejects now are practically nil. More precise adjustment of the mirror is possible. And because of the greater ease in adjustment, we have cut labor costs $2.00 per unit."

HEAT ASSEMBLY IN PRINT DRIER



Here a Waldes Truarc crescent ring, Series 5103, replaced a split collar and clamping ring. Results: labor costs cut 50¢ per unit because of greater ease of assembly. Drier provides more uniform heating.

35 MM MICRO-FILM NEGATIVE CARRIER IN ENLARGER



2 Waldes Truarc Series 5133 E-Rings replaced 2 cap nuts—at a saving of 20¢ per unit in labor costs.

Whatever you make, there's a Waldes Truarc Ring designed to save you material, machining and labor costs, and to improve the functioning of your product.

In Truarc, you get

Complete Selection: 36 functionally different types. As many as 97 standard sizes within a ring type. 5 metal specifications and 14 different finishes. All types available quickly from leading OEM distributors in 90 stocking points throughout the U. S. and Canada.

Controlled Quality from engineering and raw materials through to the finished product. Every step in manufacture watched and checked in Waldes' own modern plant.

Field Engineering Service: More than 30 engineering-minded factory representatives and 700 field men are at your call.

Design and Engineering Service not only helps you select the proper type of ring for your purpose, but also helps you use it most efficiently. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

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TRUARC®
RETAINING RINGS
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Please send new, descriptive catalog showing all types of Truarc rings and representative case history applications. *(Please print)*

Name .....
Title .....
Company .....
Business Address .....
City ..... *Zone* ..... *State* .....

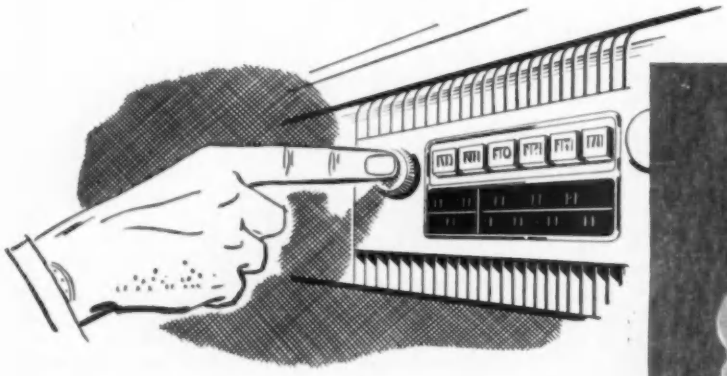
AY-129

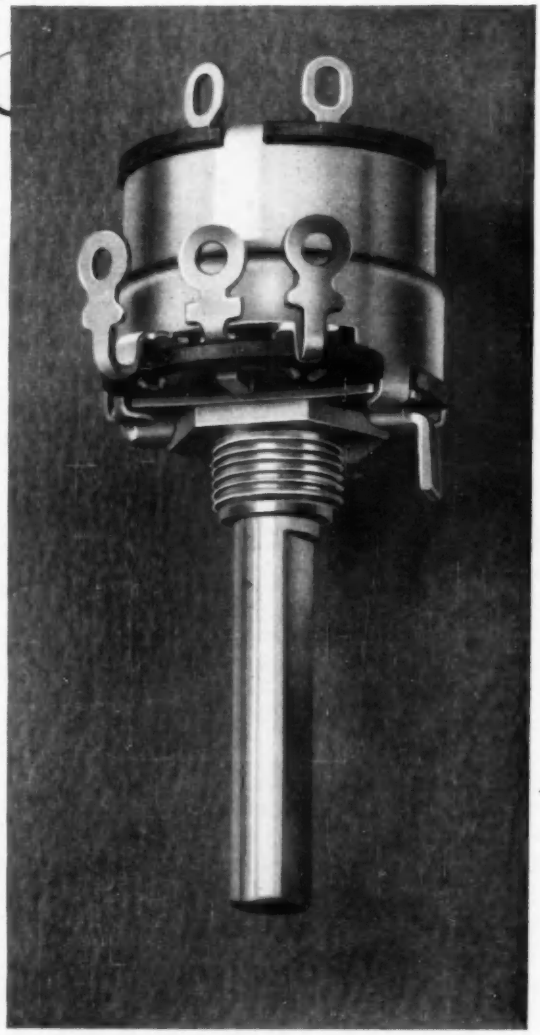
WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

Add New Convenience to Auto Radios

with this MALLORY

Pull-on . . . Push-off switch





GONE ARE THE DAYS of a car radio warming up to blast you out of the car while you fumble for the knob . . . and gone are the days of a car radio being turned on and running for hours, unheard because the volume control was not turned far enough!

The modern car radio is equipped with the new Mallory push-pull switch. Pull the volume control knob . . . with a gentle click, it's on—and the volume control setting is the same as when last turned off. Touch a finger tip to the face of the knob . . . with a gentle click, it's off—and the volume control setting remains unchanged for the next time the set will be used.

Mallory pioneered the vibrator which made auto radios practical. Now . . . Mallory has made it possible to add car radios to the growing list of controls and accessories that can be push-button controlled. This unique feature is just one more example of how manufacturers can depend on Mallory for the very latest design advancements in automotive radio components.

And a new Mallory volume control for transistor radios

This new control by Mallory has been especially designed for use in transistor receivers. It features extremely low "hop-off" resistance for smooth, precise control of transistor circuits at low volume levels. Another Mallory advance-design component for modern automotive listening pleasure.

Serving Industry with These Products:

Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
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Parts distributors in all major cities stock Mallory standard components for your convenience.

Expect more...get more from

P.R. MALLORY & CO. Inc.

MALLORY

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Steering Wheel Hubs
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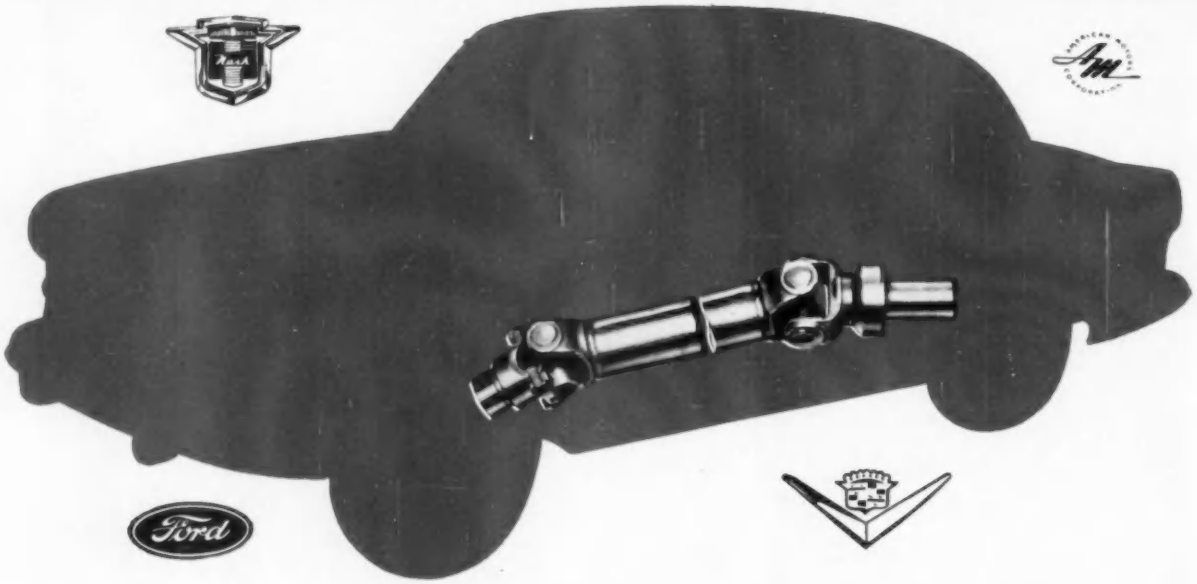
During our more than 45 years of service to the Automotive Industry, parts by "Cleveland" have served and are still serving many manufacturers whose products have won world-wide acclaim. We are proud of the part we have played in their success and proud of the reputation for reliability and ruggedness which "Cleveland" parts have won with our manufacturing customers.

When looking for component parts you can depend on, it pays you to come to "Cleveland." We will welcome the opportunity to work with you.

Cleveland Steel Products Corporation
Automotive Division
16025 Brookpark Road • Cleveland 11, Ohio

COMPETENT



For the very latest in design and highest quality workmanship — America's leading automobiles, from the smallest to the largest, rely on MECHANICS. MECHANICS drive lines are engineered to meet each customer's specific needs. Torque, size, weight, balance, angularity, runout, safety, lubrication, assembly and service problems all have been overcome — to each customer's complete satisfaction. Let us help engineer joints and drive lines to fit Your products.

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...with fasteners that assemble easily

Ferry Cap cuts no corners when it comes to accurate threading and close inspection. Ferry Cap fasteners assemble smoothly and quickly because they are precision made and because inspection takes place not once, not twice, but at every stage of manufacture—from raw material to finished product.

You'll like the fasteners you get from Ferry Cap... and you'll like our speedy delivery, too!

THE FERRY CAP & SET SCREW COMPANY

Makers of the famous Coustr-Bar® Screw for socket head applications.

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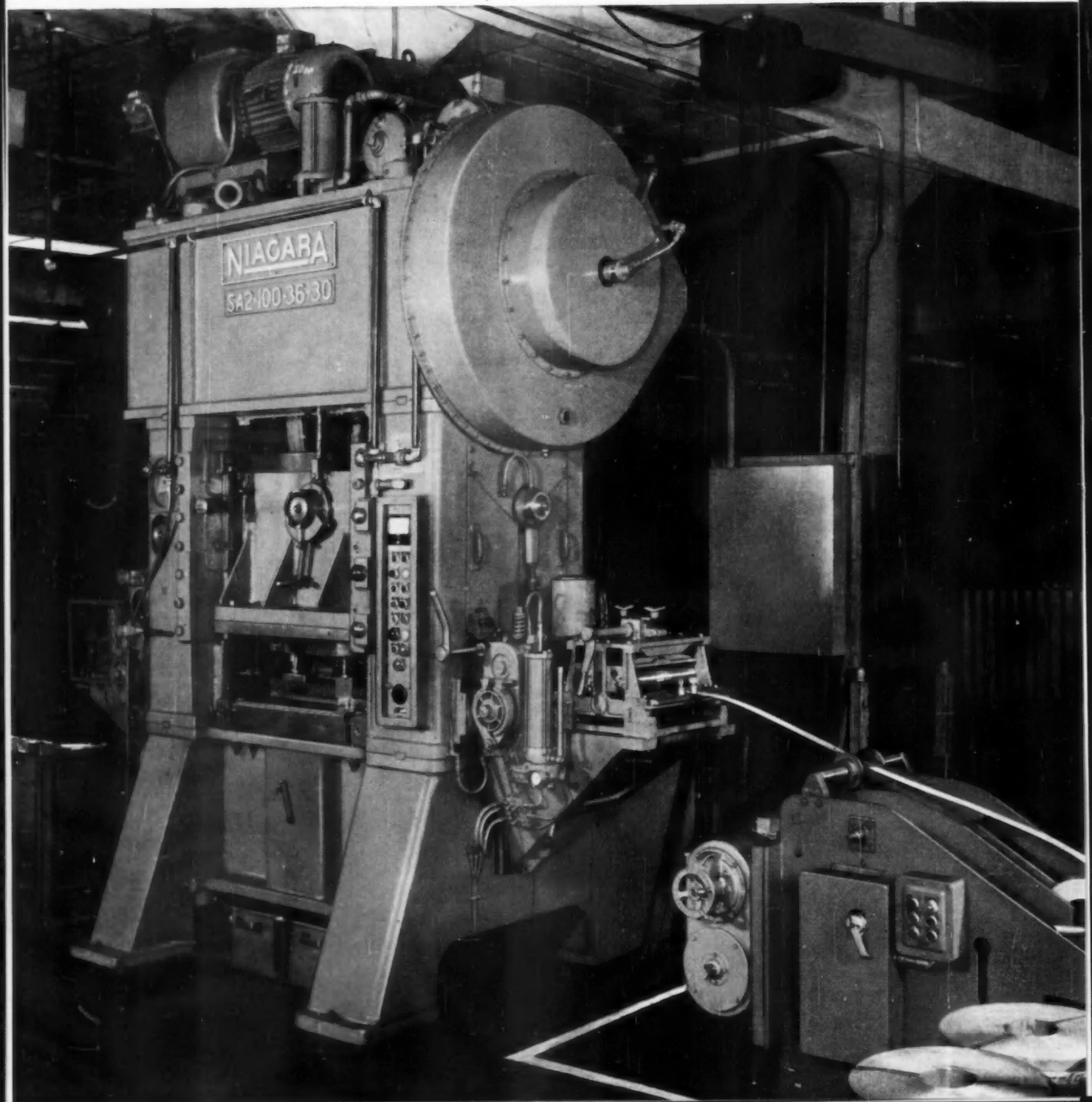
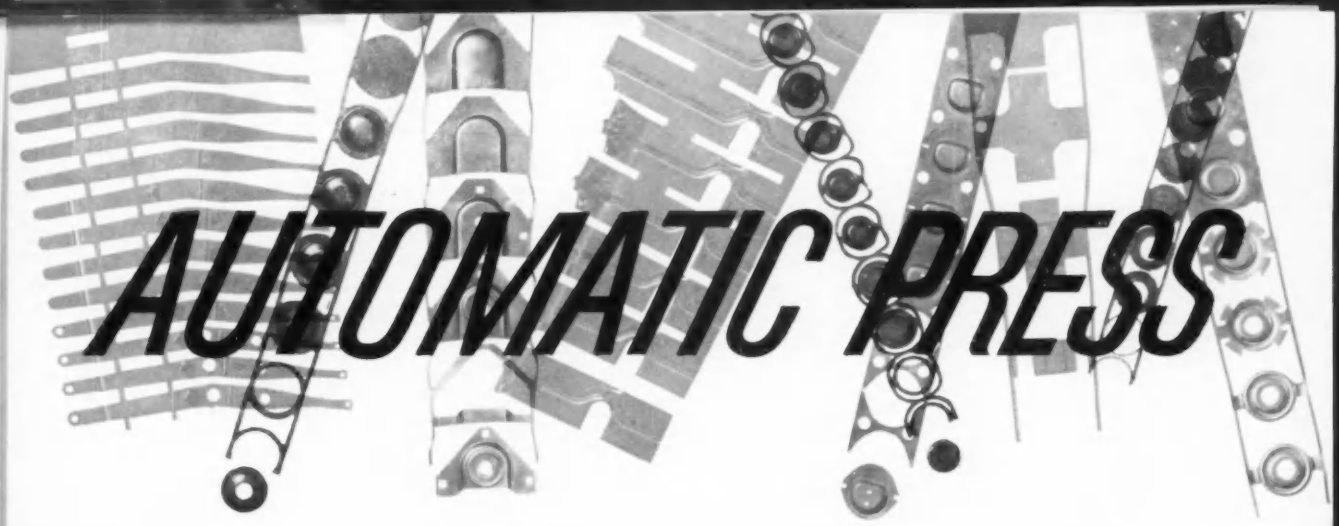
FERRY CAP *is geared to FASTER SERVICE*

Ready for you... *ALL-NEW*





AUTOMATIC PRESS

to give you more stampings per hour at less cost...in long and short runs

Build your stamping profits to new heights the modern way: Automatically . . . with an all-new Niagara SA-2. Here's an up-to-the-minute press package that is distinctly different from anything heretofore available . . . complete with ultra-modern automatic feed, plus today's most advanced press mounted controls and devices, to bring you high speed stamping at its very best.

Brand new from crown to base, the Niagara Automatic boasts bonus features throughout . . . features that are unavailable on any other press in this category. Yes, *everything* is new about it, differing sharply from modified, adapted straight side presses of conventional design. Every square inch of its extra massive, rugged construction is *heavier . . . far heavier* for vibration-free, precision performance at high speeds:

KING SIZE CRANKSHAFT AND CRANKPINS — substantially larger than those on traditional straight side presses.

ENTIRE DRIVE IS HEAVIER — gears, electro pneumatic friction clutch, brake, flywheel and motor.

EXTRA BEARINGS — for better support of crankshaft, feed take-off and main gear (or flywheel).

MASSIVE, EXTRA HEAVY FRAME — all steel, 4-piece, tie rod, box type construction (bed, uprights and crown) built to absorb shock and vibration, and provide greater resistance to deflection. Up to 100% heavier than regular straight side press construction. Uprights extra wide to house electrical and circulating oil controls.

RIGID, EXTRA REINFORCED, BOX TYPE SLIDE remains in precise alignment with bed.

EXTRA LONG, SPECIAL SQUARE GIBS guide slide precisely.

LAMINATED, NON-METALLIC WAYS positively prevent welding or galling of bearing surfaces.

AUTOMATIC CIRCULATING OIL SYSTEM keeps all press bearing surfaces continuously lubricated.

ULTRA-MODERN AUTOMATIC FEED perfectly mated to press.

EXCLUSIVE NIAGARA MECHANICAL ROLL LIFTING SYSTEM — built into the press for independent, infinite adjustment of ingoing — outgoing rolls, from floor level.

OVERSIZE ADJUSTABLE AIR COUNTERBALANCE for smoother, safer press performance.

From start to finish, automatic stamping the Niagara SA-2 way, spells endless economies for you. It will pay you to investigate the facts *now*.

THE FULL STORY is unfolded for you, feature by feature, in new, illustrated Bulletin 264. Write for your copy today . . . then consult a Niagara representative.

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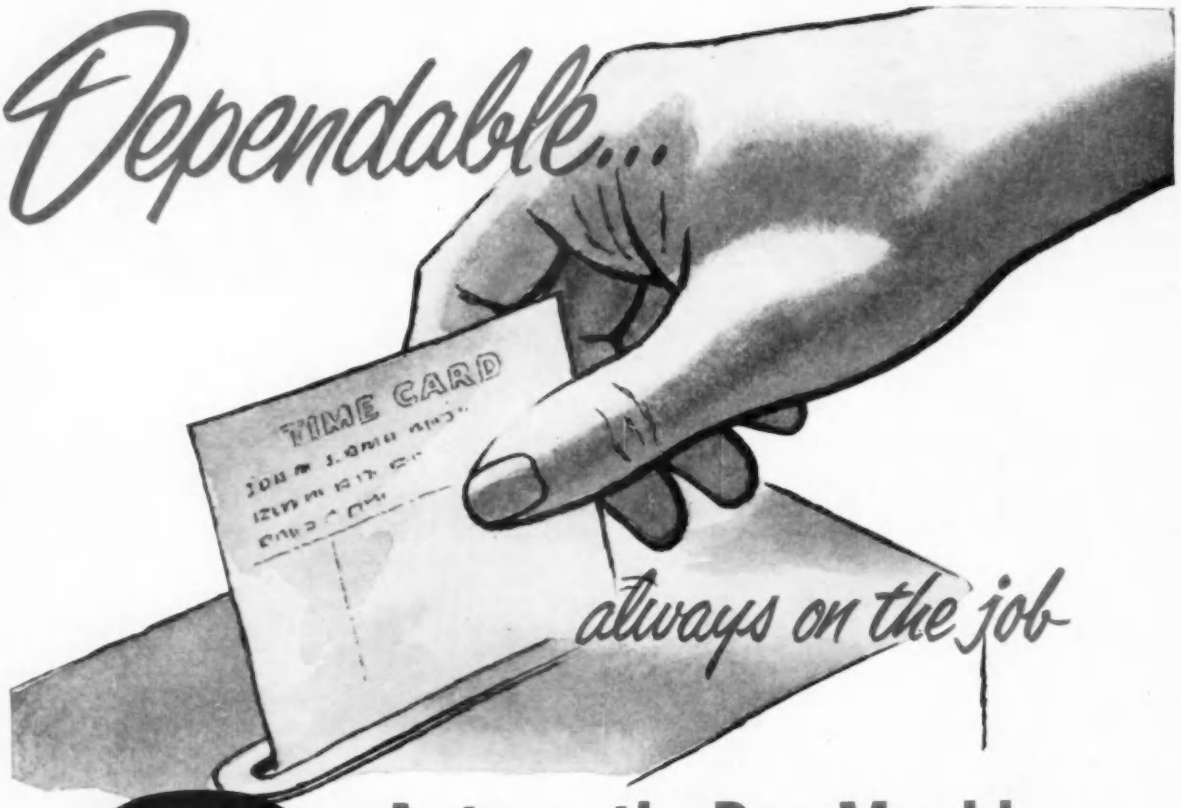
NIAGARA

SERIES SA-2, TWO-POINT STRAIGHT SIDE PRESSES

SHAFT DIAMETERS: 4½-9 INCHES • CAPACITIES: 60-300 TONS

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work

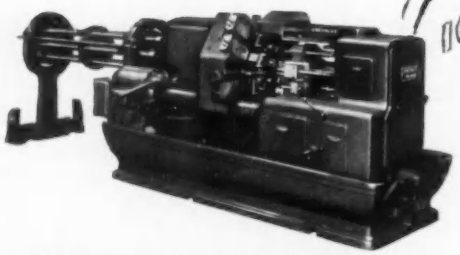
Dependable...



PRODUCTION MACHINERY

GREENLEE

Automatic Bar Machines



SIX AND FOUR-SPINDLE AUTOMATIC BAR MACHINES

GREENLEE Special Machine Tools

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Hydro-Borer Precision Boring Machines

BOOST PRODUCTION REDUCE DOWN TIME

It's easy to maintain rigid production schedules . . . prevent costly bottlenecks with Greenlee Bar Automatics. They are always on the job . . . give continuous, reliable service.

You hear much comment about Greenlees' uninterrupted, round-the-clock performance in widely different industries. With good reason, too, for Greenlee offers years of manufacturing experience... plus manufacturing integrity not often duplicated.

Want complete information? Call in the Greenlee man. Let him give you the complete story. Please submit a print when inquiring about a specific job.

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ROCKFORD, ILLINOIS

"The best parts? Sure, they're made of Stainless"

"As head of the Parts Department, I get a close-up view of this swing to Stainless Steel, and I think it's the smartest move the auto makers could make." This from the manager of the Parts Department of a large midwestern agency.

"They say if replacement parts are made of cheap materials, our business would be better. We haven't found that to be true. Just the opposite in fact. As parts are improved, our business, anyway, has continued to grow. Our customers realize the added value of Stainless Steel."

Stainless trim and accessories keep cars looking better, longer, both inside and out. Stainless parts, like the rear fender plate, shown above, shrug off flying stones, road salt, etc., without marking, discoloring, peeling or corroding.

Much of the Stainless Steel being used by leading automotive concerns comes from the mills of Sharon—where buyers know they can expect consistent quality plus the industry's finest finish.

SHARONSTEEL

SHARON STEEL CORPORATION

SHARON, PENNSYLVANIA

DISTRICT SALES OFFICES: Chicago, Cincinnati, Cleveland, Dayton, Detroit, Grand Rapids, Indianapolis, Los Angeles, Milwaukee, New York, Philadelphia, Rochester, San Francisco, Sharon, Seattle, Montreal, Que., Toronto, Ont.

9979

There's no substitute for the FORGED crankshaft

Crankshaft forgings illustrated, left to right, for V-8 passenger car, diesel truck and heavy tractor engines

Crankshafts have been made successfully by other methods of fabrication and have proven to be *good enough* for certain non-critical applications — but for maximum dependability of the modern, compact, high compression, high torque engine a forged crankshaft is essential.

The forging process assures, to the greatest degree possible, uniformity and predictability of physical properties with a minimum variance from piece to piece or from one location to another in the same piece.

Wyman-Gordon has been forging crankshafts since the beginning of the internal combustion engine era and today produces more crankshafts for a greater variety of applications than any other company in the world. In a crankshaft there is no substitute for a forging, and in a forging there is no substitute for Wyman-Gordon quality and experience.

WYMAN-GORDON COMPANY

Established 1883

WORCESTER 1, MASSACHUSETTS
HARVEY, ILLINOIS • DETROIT, MICHIGAN

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

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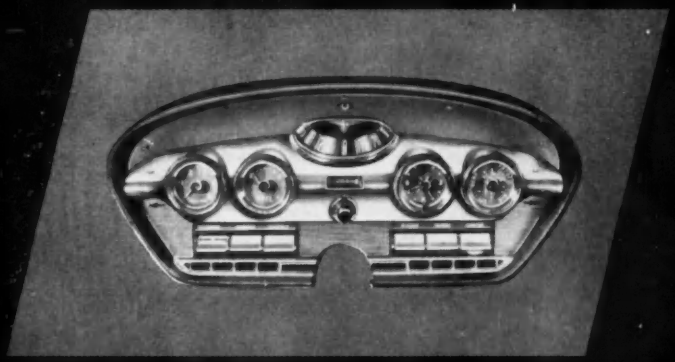
MILWAUKEE, NEW YORK, PHILADELPHIA, ROCHESTER, SAN FRANCISCO, SHARON, SEATTLE, MONTREAL, QUE., TORONTO, ONT.

DISTINCTIVE

AUTOMOTIVE

INSTRUMENTATION



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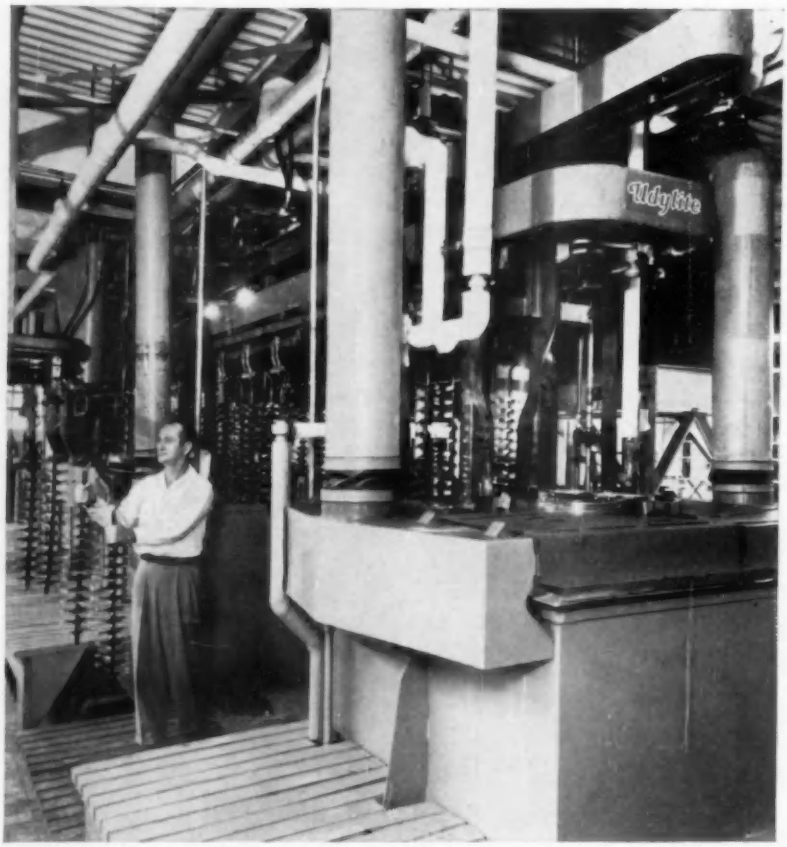
KING-SEELEY CORPORATION

ANN ARBOR,

MICHIGAN



Udylite Machine and Process combine to set new Scripto standards

The Udylite Cyclemaster provides the accuracy and steady flow of production. Udylite Bright Nickel furnishes the sparkling finish. Together they solve for Scripto, of Atlanta, Georgia, the knotty problem of better finish of the Scripto pens, pencils and cigarette lighters.

Scripto's first bright nickel was the Udylite #31 process. It was superseded by the Udylite #514 process to gain the faster brightening which is so important in nickel plating to a high luster with a thin coat.

The adoption of Udylite Bright Nickel Process #724 was the next step as it offered still faster brightening and even more important all the time saving advantages of all liquid brighteners.

Step by step Scripto has lowered costs and improved quality with Udylite Processes and Precision Automatic Plating. Here is just one of many examples of the right application of process and equipment. Out of the line of Udylite products can come the answer to your problem as well.

Contact your local Udylite Sales Representative . . . let him show you how the *right* combination of Udylite processes and machines can improve your quality and production.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

CALENDAR

OF COMING SHOWS AND MEETINGS

Automotive Electric Association, annual membership meeting, Edgewater Beach Hotel, Chicago, Ill. .....Dec. 8-13

Eastern Joint Computer Conference, Sheraton Park Hotel, Washington, D. C. .....Dec. 9-13

Society of the Plastics Industry Conference, Hotel Commodore, New York, N. Y. .....Dec. 10-11

1958

Chicago Automobile Show, International Amphitheatre, Chicago, Ill. .....Jan. 4-12

SAE Annual Meeting and Engineering Display, Sheraton-Cadillac and Statler Hotels, Detroit, Mich. .....Jan. 13-17

National Motor Boat Show, Coliseum, New York, N. Y.....Jan. 17-26

Truck-Trailer Manufacturers Association, annual convention, Palm Beach Biltmore, Palm Beach, Fla. .....Jan. 20-22

Plant Maintenance and Engineering Show, International Amphitheatre, Chicago, Ill. .....Jan. 27-30

Instrument Society of America, national conference on chemical and petroleum instrumentation, Wilmington, Del. .....Feb. 3-4

Automotive Accessories Manufacturers of America Exposition, Navy Pier, Chicago, Ill.....Feb. 3-6

Reinforced Plastics Division of Society of Plastics Industry, Inc., annual technical and management conference, Edgewater Beach Hotel, Chicago, Ill....Feb. 4-6

American Society for Quality Control, Administrative Applications Div. annual conference, Carter Hotel, Cleveland, O...Feb. 7-8

Motor and Equipment Wholesalers Association, national convention, Statler Hotel, Los Angeles, Calif. .....Feb. 18-19

Pacific Automotive Show, Pan Pacific Auditorium, Los Angeles, Calif. .....Feb. 20-23

SAE Passenger Car, Body and Materials Meeting, Sheraton-Cadillac Hotel, Detroit, Mich.....Mar. 4-6

Instrument Society of America, Pittsburgh Section Annual Conference on Instrumentation for Iron and Steel Industry, Roosevelt Hotel, Pittsburgh, Pa..Mar. 11-13

Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago, Ill. .....Mar. 17-18

International Atomic Exposition, Inc., International Amphitheatre, Chicago, Ill. .....Mar. 17-21

Now! A Complete Line of Self-Locking Microsize UNBRAKO Socket Cap and Set Screws

Nos. 0, 1, 2 and 3 in alloy steel and stainless steel are available with the Nylok* feature

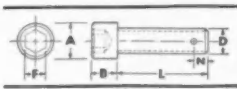
You effect major economies in time and money when you design and assemble small devices with self-locking microsize UNBRAKO socket screws. These close tolerance screws won't work loose. They simplify standardization of small devices where maximum reduction of weight is required without sacrifice of strength. They eliminate the necessity of designing costly special screws to fasten tiny parts in compact assemblies and they prevent the waste of production time while waiting for delivery of special screws.

In addition to having the overall advantages of microsize UNBRAKO socket screws, these screws can be used in holes tapped in soft or die cast materials without stripping threads and ruining expensive work. Also the set screws can be used with hardened shafts, since they lock against the threads of the tapped hole.

All UNBRAKO socket screws can be supplied with the self-locking Nylok feature. The UNBRAKO with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Seated or not, the screw locks positively wherever wrenching stops, won't work loose—because the tough resilient nylon pellet forces mating threads together.

Ask your authorized industrial distributor for details today. He carries complete stocks of self-locking UNBRAKO socket screws (caps and sets from #0 through 1 in., button heads #4 through ⅝ in., flat heads from #4 through ¾ in.). Or write us for literature and samples. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 53, Pa.

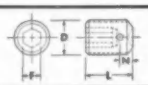
*T.M. Reg. U.S. Pat. Off., The Nylok Corporation



HEAT-TREATED ALLOY STEEL
Self-Locking Microsize UNBRAKO
Socket Cap Screws
Class 3A Threads

Screw Size		Threads per in. NC	Threads per in. NF	L Over-all Length	N Pellet Location NC	N Pellet Location NF	Torque Max. prev. on	Torque 1st off stat. min.	Torque 5th off stat. min.
#0	A .104	—	80	1/8	—	.047	5.5	14.0★	7.0★
	B .060	—	80	3/16	—	.047	5.5	14.0★	7.0★
	D .060	—	80	1/4	—	.047	5.5	14.0★	7.0★
	F .050	—	80	3/8	—	.047	5.5	14.0★	7.0★
#1	A .118	—	72	1/8	—	.047	11.0	28.0★	14.0★
	B .073	—	72	3/16	—	.047	11.0	28.0★	14.0★
	D .073	—	72	1/4	—	.047	11.0	28.0★	14.0★
	F .050	—	72	3/8	—	.047	11.0	28.0★	14.0★
#2	A .140	56	—	3/16	.063	—	24.0	3.0	1.5
	B .086	56	—	1/4	.063	—	24.0	3.0	1.5
	D .086	56	—	3/8	.063	—	24.0	3.0	1.5
	F 1/16	56	—	1/2	.063	—	24.0	3.0	1.5
#3	A .161	48	—	3/16	.063	—	40.0	6.5	3.0
	B .099	48	—	1/4	.063	—	40.0	6.5	3.0
	D .099	48	—	3/8	.063	—	40.0	6.5	3.0
	F 5/64	48	—	1/2	.063	—	40.0	6.5	3.0

★Measured in in.-gm. (those not marked with a star are measured in in.-oz.)



HEAT-TREATED ALLOY STEEL
Self-Locking Microsize UNBRAKO
Socket Set Screws
Class 3A Threads

Screw Size		Threads per in. NC	Threads per in. NF	L Over-all Length	N Pellet Location NC	N Pellet Location NF	Torque Max. prev. on	Torque 1st off stat. min.	Torque 5th off stat. min.
#0	D .060 F .028	—	80	3/32	—	.047	5.5	14.0★	7.0★
		—	80	1/8	—	.047	5.5	14.0★	7.0★
		—	80	5/32	—	.047	5.5	14.0★	7.0★
		—	80	3/16	—	.047	5.5	14.0★	7.0★
		—	80	1/4	—	.047	5.5	14.0★	7.0★
#1	D .073 F .035	—	72	1/8	—	.062	11.0	28.0★	14.0★
		—	72	5/32	—	.062	11.0	28.0★	14.0★
		—	72	3/16	—	.062	11.0	28.0★	14.0★
		—	72	1/4	—	.062	11.0	28.0★	14.0★
#2	D .086 F .035	56	—	1/8	.062	—	24.0	3.0	1.5
		56	—	5/32	.062	—	24.0	3.0	1.5
		56	—	3/16	.062	—	24.0	3.0	1.5
		56	—	1/4	.062	—	24.0	3.0	1.5
#3	D .099 F .050	48	—	5/32	.093	—	40.0	6.5	3.0
		48	—	3/16	.093	—	40.0	6.5	3.0
		48	—	1/4	.093	—	40.0	6.5	3.0

★Measured in in.-gm. (those not marked with a star are measured in in.-oz.)

Self-locking microsize UNBRAKO socket cap and set screws are available in sizes #0 through #3, in heat treated alloy steel (plated or unplated) and stainless steel, at your authorized industrial distributor. He also carries a complete stock of other self-locking UNBRAKO socket screws.

We also manufacture precision titanium fasteners. Write for free booklet.

SPS Jenkintown • Pennsylvania

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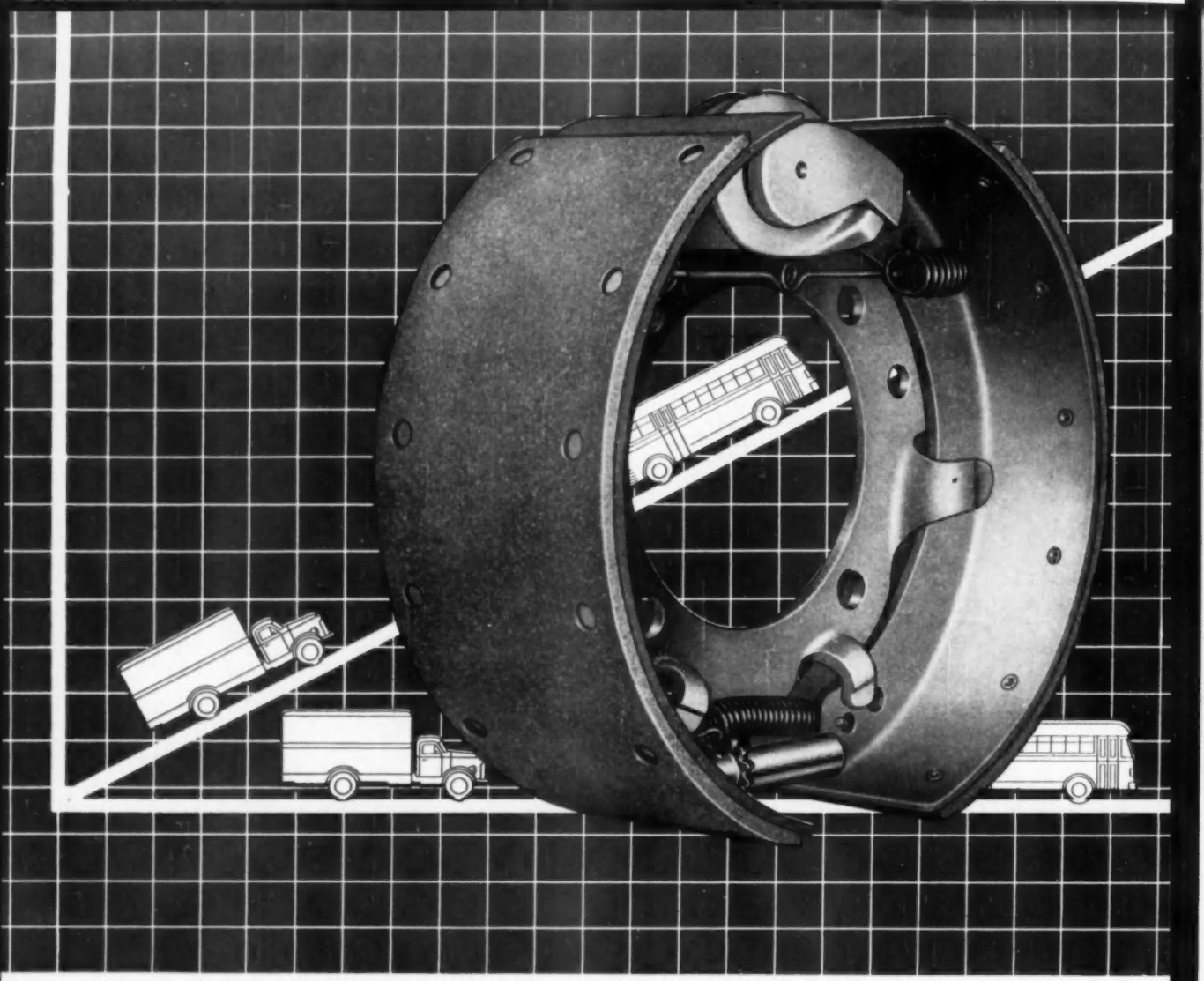

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Power to hold on grades . . . Power to stop at road speeds

The Bendix* Duo-Duty auxiliary brake serves the double purpose of a positive parking brake and an emergency road-speed brake.

FOR PARKING, the Duo-Duty brake has ample torque capacity to keep the braked wheels from rolling on any hill or ramp, regardless of how steep.

FOR EMERGENCIES, it has the torque and thermal capacity to serve as a dependable stand-by brake at road speeds should the main braking system, for any reason, fail to work.

Minimum physical pull at the hand lever, less weight, fewer parts, mechanically simple.

A heavy-duty drive shaft brake that is rugged and right . . . built and backed by Bendix.

*REG. U.S. PAT. OFF.

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High Spots of This Issue

▼ **Buick's Multi-Pitch Dynaflow Production**

This article describes production facilities for turning out Buick's new Multi-Pitch Dynaflow for its 1958 line. Operations on three major parts are covered: the aluminum transmission case; aluminum rear-bearing retainer; and cast iron front pump body. Page 48.

▼ **Removing Oxides from Molybdenum**

A practical method for removing oxides from molybdenum without attacking the base metal has been developed at Ryan Aeronautical Co. Details of the process, which involves an oxide converting bath and a smut removing bath, are given here. Page 53.

▼ **Accelerated Salt Spray Testing of Plated Parts**

Engineers at the Cadillac Materials Laboratory have devised an accelerated test for evaluating the corrosion characteristics of plated parts. Laboratory test results are discussed in this article and compared with reported field failures. Page 54.

▼ **Pontiac's Automatic Foundry**

Pontiac Motor Div. foundry engineers have proved that automation is more than a theory by achieving a production rate of 2400 V-8 engine block castings a day. How they solved problems, such as handling equipment weighing a ton or more, is told here. Page 56.

▼ **1958 Engines Offer Wide Variety of Induction Systems**

This comprehensive report on V-8 engines offered in 1958 passenger cars contains general information—as well as comparative data—on carburetor designs and combinations, fuel injection systems, and engine performance characteristics. Page 60.

▼ **45 New Product Items And Other High Spots, Such As**

Edsel use of aluminum; Scottish automobile show; air-powered tools; new plating methods; French automobile industry; SAE meetings; hydraulics conference; handling od wide sheet metal; new silicone fluids; and industry statistics.

AUTOMOTIVE INDUSTRIES COVERS
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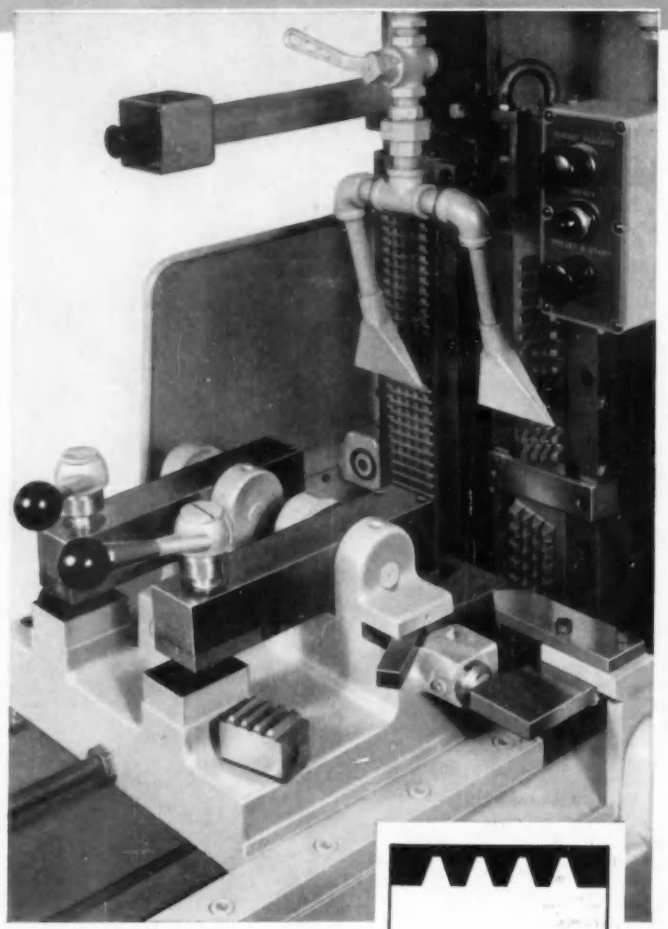
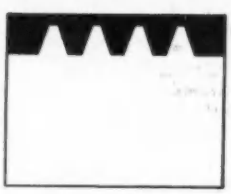
Operation Rack Teeth

Completed in Two Steps on Cincinnati Hydro-Broach Machine

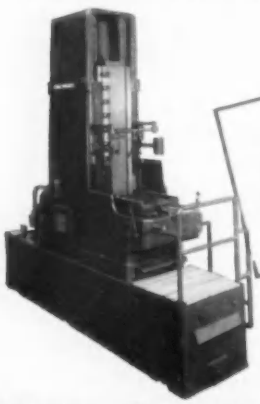
A lot of metal is removed while machining coarse pitch rack teeth. Depth of cut may appear excessive for broaching, but with proper tooling, the broaching method can be highly successful. The CINCINNATI® Single Ram Hydro-Broach Machine illustrated here turns in an excellent performance record for a job of this type... broaching four unevenly spaced rack teeth. Total depth of cut about 7/16". The fixture is a manually operated, two-station progressive type. The top of the teeth are broached in the left-hand station, and depth of teeth in the right-hand station. ¶ The machine is built for heavy duty work. Ram and table ways are hardened and ground; automatically pressure lubricated; square gibbed with narrow guides. Table advances to positive stop and automatically clamps. Convenient chip removal from front of machine, while the operator is working. 20 to 30 hp drive. ¶ Heavy stock removal operations are a problem in every shop, especially where a considerable volume of production must be maintained. Perhaps you could do a better job at lower cost on CINCINNATI Hydro-Broach Machines. Our Engineering Service Specialists are ready to give you the benefit of their experience. May we hear from you?

Special Machine Tool Division
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO





Drawing of part. Black area indicates metal removed. Total depth of cut about 7/16" max.



CINCINNATI
SINGLE RAM VERTICAL
HYDRO-BROACH MACHINE
Catalog No. M-1745-1

Production data:

Part name	Ball nut
Material	Steel
Operation	Broach top and rack teeth
Production	100 per hour
Machine	CINCINNATI No. 10-66 Single Ram Vertical Hydro-Broach

CINCINNATI

Special Machine Tools and Complete Production Lines

News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 117, No. 11 December 1, 1957

American Motors to Build Small Rambler in Kenosha

American Motors, firm in its confidence in the small car market, is set to build 25,000 Rambler American cars during the 1958 model year. First of the 100-in. wheelbase Ramblers were scheduled for production at Kenosha, Wis., on Dec. 2.

AMC is using the basic dies from its previous 100-in. wheelbase Rambler, discontinued after the 1955 season. The '58 Rambler American will go on sale in January.

Under the new production set-up, AMC is building the Rambler American bodies in Kenosha and all other Rambler bodies (108 and 117 in. wheelbase) in Milwaukee. Assembly of the smaller car is on the same line with the Rambler Six 108 in. models.

Employment at the Wisconsin plants was estimated at 10,500 by Dec. 1, nearly double the 5800 in late July, when production of 1957 models began to taper off.

AMC hopes to reach a production rate of 800 units a day by March, 1958. This would mean final assembly on an overtime basis at Kenosha. AMC has reported four increases in production schedules since the introduction of current models.

AMC president George Romney reported a net profit of more than $1 million during October, the first month of the company's fiscal year. Record Rambler sales and a reduction in expenses in the appliance and defense operations led to the profit, he said.

Mercury Plans New Medalist For Low-Priced Competition

Lincoln and Mercury Div. plans to meet competition at the lower end of its Mercury price range with a new model, probably to be called the Medalist. The 1958 version of the Medalist, available after Jan. 1, will be priced about $100 lower than current Monterey models.

Mercury's present plans for the new car call for less color and trim variations and the use of some components common to other Ford Motor Co. cars. The car will be powered either by a 312 or a 292 cu-in. engine.

FIAT SPYDER IS RESTYLED VERSION OF 1100 MODEL

Fiat's Spyder 1200 is a restyled version of the 1100 model. The four-cylinder engine has a bore of 2.88 in., stroke of 3 in., and displacement of 74.48 cu. in. Output is 55 bhp at 5300 rpm, and compression ratio is 8 to 1.

Two New Hardtop Models Announced by Studebaker

Studebaker-Packard Corp. has announced two new Studebaker hardtop models in the President and Commander series, in addition to the sedan and station wagon models introduced earlier.

The new President hardtop is powered by Studebaker's overhead valve V-8 engine with 289 cu in. displacement and 225 hp. The Commander has the 289 cu in. engine with a 180-hp rating.

Both hardtops have 14 in. wheels and dual headlights as standard equipment. Wheelbase is 116.5 in.; overall length, 202.4 in.; and height, 57.25 in.

Goodyear Completes Expansion Of Akron Synthetics Plant

Goodyear Tire & Rubber Co. has completed a $2.75 million expansion at its Akron synthetic latex plant, doubling the plant's capacity to 27,500 tons a year. The new production facilities, combined with Goodyear's recently-expanded Houston plant, give the company a yearly output capacity of 247,500 tons of all synthetics.

Included in the Akron plant expansion are 10 new reactors, each with a capacity of 2750 gallons; and a new recovery area of two butadiene and two styrene recovery columns. Increased latex storage facilities offer 200 per cent more storage area.

New pumping facilities are capable of circulating 20,000 gallons of water a minute. Water is cooled for reuse, so that only 720,000 gallons of new water is required each day.

NEWS AUTOMOTIVE AND AVIATION

STANDARD INTRODUCES ECONOMY FOUR-DOOR SEDAN

Standard Ensign is an economy version of the Vanguard four-door sedan. It has the same basic body but is powered by a smaller four-cylinder engine of 100.2-cu in. displacement that develops 60 bhp at 4000 rpm. The four-speed transmission has a central shift lever with remote linkage. External appearance is altered by a new radiator grille and smaller wheels.

Automobile Industry Building Toward Six Million Production

The automobile industry appears certain to produce more than six million passenger cars in 1957—barring, of course, the unexpected. By mid-November, U. S. factories had turned out 5,317,443 passenger cars, with about 30 full working days still remaining.

Production for the week ending Nov. 16 totaled 142,376, highest since last February. An average of 130,000 units weekly would put the industry over the six-million mark with plenty to spare.

Truck production, however, was running slightly behind 1956, with 963,179 units produced by Nov. 16. With no cutbacks or other interruptions, truck production should top one million, holding its fall rate of 20,000 plus a week.

RILEY ONE-POINT-FIVE HAS SPORTS CAR APPEAL

The Riley One-Point-Five is designed to appeal to people who like sports car performance in modern passenger car comfort. The B.M.C. "B" series four-cylinder 90.88-cu in. engine, fitted with twin S.U. carburetors, develops 68 bhp at 5400 rpm, with a compression ratio of 8.3 to 1. The One-Point-Five is built on an 86-in wheelbase and has an overall length of 153 in.

Finance Firms Predict Good Automobile Year

So far as the independent finance business can see, 1958 should be a good year for the automobile industry.

Money will continue to carry a high interest rate, but there will be enough to supply both producers and customers. Borrowers can expect to pay perhaps $2.50 more per $1,000 for a loan on a 1958 model than they paid on a 1957 car.

These are the views of American Finance Conference executives, interviewed at the recent AFC convention in Washington.

The lenders are not alarmed at the quantity of automobile installment credit, which they figure to be $16 billion of a total of $32 billion in installment debt. AFC finds almost all consumers are good credit risks and haven't overreached their ability to repay.

Conferees heard Byron J. Nichols, Chrysler Corp. vice-president and general manager of marketing, outline the probabilities for sales of more than six million 1958-model cars. On the roads now, he said, are 19 million cars that are one to three years old. Automobiles in this range account for a large percentage of trade-ins. Owners of 1955 models, in particular, may be ready to buy new ones.

Waukesha Buys Climax Engine; Plans to Broaden Line

Waukesha Motor Co. of Waukesha, Wis., plans to broaden its engine line with the added facilities of the Climax Engine Co., which Waukesha purchased recently. The Wisconsin manufacturer said the new facilities would enable it to offer engines with power capacities between the ratings of the existing models.

Waukesha Motor added 160,000 sq ft of floor space and a foundry at Clinton, Ia., to its present 20-acre home plant.

GM Refunds $4 Million On Jet Aircraft Profits

General Motors has refunded the U. S. Air Force $5 million on profits GM made on jet aircraft contracts during the Korean War. GM had been accused of collecting excess profits of $17.4 million on the aircraft contracts, but a company spokesman said the profits were "fair and reasonable" and that the amount was due to efficiency of operation. Refund of another $700,000 was pending.

Aluminum Use Averages 44.9 Lb In 1958 Cars, Kaiser Reports

Further evidence of the growing use of aluminum in U. S. cars is provided in an analysis of 1958 models compiled by Kaiser Aluminum & Chemical Sales, Inc.

Results of the survey show a 13 per cent greater use of aluminum in 1958 models over the previous year and a gain of 81 per cent over 1955. The average amount of aluminum in the new models is 44.9 lb, as compared with 39.6 lb in 1957 and 24.8 lb in 1955, according to the Kaiser breakdown.

The General Motors line for 1958 scored the biggest gain with an average 30 per cent per car increase, from 32 to 41.6 lb. The Chevrolet alone uses 45 per cent more aluminum than in the previous year.

The highest aluminum average—119 lb—is used in the Chrysler Imperial line. However, some top luxury models exceed this figure in using more than 200 lb of the light metal.

Detailed results of the Kaiser survey are tabulated below.

AVERAGE POUNDS PER CAR

	1957	1958
Chevrolet	21.4	31.0
Pontiac	36.2	43.8
Oldsmobile	42.5	54.7
Buick	48.7	57.5
Cadillac	60.6	70.4
General Motors Corp.	**32.0**	**41.6**
Ford	32.4	36.2
Edsel	...	48.0
Mercury	48.0	48.0
Lincoln	75.9	87.6
Ford Motor Co.	**35.7**	**39.6**
Plymouth	52.4	52.0
Dodge	54.6	52.2
DeSoto	85.9	82.3
Chrysler	103.7	98.5
Imperial	126.5	119.0
Chrysler Corp.	**65.2**	**63.3**
American Motors Corp.	**48.8**	**48.8**
Studebaker-Packard Corp.	**22.6**	**22.6**
All Makes	**39.6**	**44.9**

Automobile Plant Programs Cost $1.28 Billion in 1957

The automobile industry spent approximately $1.28 billion in 1957 on new plants and expansion and modernization of existing facilities, exclusive of special tooling. Nearly all of this sum was spent by the Big Three. During the coming year, the figure probably will be less than $1 billion.

General Motors projects during 1957, which totaled nearly $700 million, included as major outlays the Norwood, O., Fisher Body Div. plant (478,778 sq ft), begun in 1955; the Hudson, O., Euclid Div. plant (650,000 sq ft), on which ground was broken last March; and the Massena, N. Y., Chevrolet Div. aluminum foundry (180,000 sq ft), started only last month. Most of the Massena budget is for 1958, but GM probably will spend less next year than in 1957 for plants and facilities.

Chrysler expects to spend about $130 million in 1958, approximately equal to its 1957 budget. A large part of the 1958 money will go into the new Plymouth assembly and body plant near St. Louis, Mo. Chief among 1957 outlays were the Newark, Del., assembly plant for Plymouth and Dodge cars, and the Twinsburg, O., stamping plant.

Ford Motor Co. reported earlier (A I, Sept. 15, 1957, p. 36) that completion of current programs would require approximately $460 million. Of this, about 90 per cent will be spent during the coming year. Ford's 1957 outlay included putting seven plants into operation for the beginning of the 1958 model run. Still to be opened are plants in Lorain and Sharonville, O., and several smaller buildings. A new office building for the Ford Div. was opened two months ago in Dearborn.

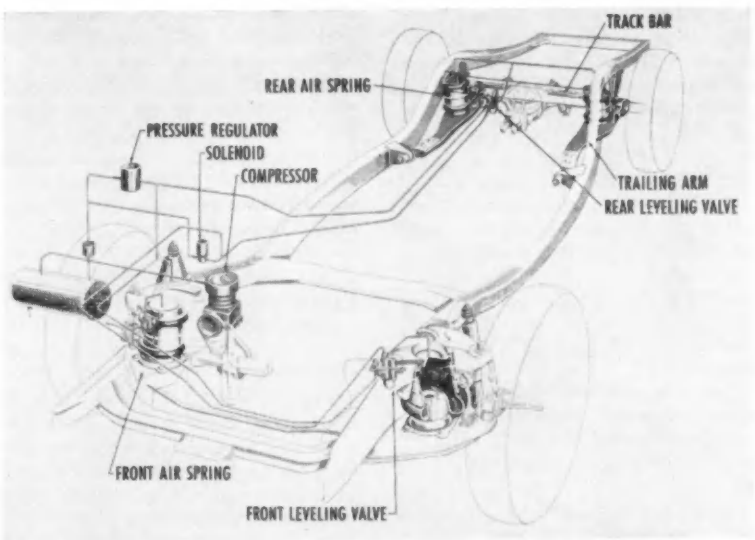
Since the automobile manufacturers were geared to production of seven million-plus in 1955, most of the major plant construction is out of the way, and capital expenditures during 1958 probably will be mainly for expansion and modernization. Tooling costs—always a closely guarded secret—should be considerably higher for 1959 models than the 1958 costs, since 1959 is expected to be a year of major change.

S-P Cuts Loss in Nine Months, Looks for Profit by Year-End

Studebaker-Packard Corp. reduced its losses for the first nine months of 1957 to $12,365,689, and looked to operating at a profitable rate by the end of 1957. Losses during the same period a year ago totaled more than $14 million.

S-P president Harold E. Churchill said the corporation has launched a new and broader advertising campaign to push sales of '58 models. S-P registrations during the third period increased slightly over the first half of 1957, and price increases on 1958 models were below industry increases.

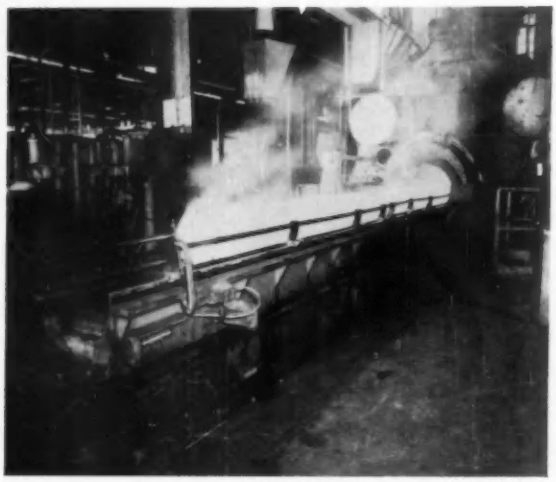
The company credits introduction of its low-priced Studebaker Scotsman for its improved position during the third quarter.



EDSEL INTRODUCES NEW AIR SUSPENSION SYSTEM

This diagram shows operation of "Edsel Air Level Ride" air suspension system, now available as an extra-cost option on all 18 models of the Edsel line. The compressor is driven from the crankshaft and supplies air to the reserve tank mounted beneath the right front fender. From there it is released, as needed, to the four rubber air cylinders which replace conventional front coil and rear leaf springs. Edsel Air Level Ride automatically compensates for weight distribution of either passengers or cargo, keeping the car level at all times.

News AUTOMOTIVE AND AVIATION



GIANT PRESS

Giant 12,000 ton extrusion press extrudes a 46-ft length of heavy-wall tubing from a chrome moly steel billet at the Metals Processing Div. of Curtiss - Wright Corp. Weld - free, seamless heavy-wall tubing is available in lengths up to 60 ft and in diameters up to 20 in. O.D. for nuclear, chemical, oil refining, missile, and other applications.

Model of Giant Press Viewed At Curtiss-Wright Metal Show

A 12,000 ton horizontal extrusion press is producing heavy-wall steel tubing, three times longer than any previously fabricated for commercial use, at the Metals Processing Div. of Curtiss-Wright Corp.

A 4-ft scale model of the giant machine was displayed recently at the Waldorf-Astoria Hotel, New York City, at a private showing of the company's latest metals processing techniques and products.

The 126-ft long, 3-cylinder extrusion press, said to be the world's largest, can handle billets up to 65 in. long and 21 to 26 in. in diameter.

To demonstrate the huge machine's power, the company displayed a 46-ft length of weld-free heavy-wall tubing, 16 in. in diameter and weighing almost 5000 lb. This huge pipe, extruded from a chrome moly steel billet, was produced by the press in a matter of seconds.

Company officials said that the pipe's improved mechanical properties, particularly the high ratio of tensile strength to ductility, will make it useful in both commercial and military applications. In addition, they pointed out, cost savings have been achieved through the elimination of welding.

Automobile Makers Placing Stress on Unit Construction

Unit construction is getting more attention from Big Three engineers, and it appears that all three of the major automobile producers could be using the unit system by 1961. One company will be ready by 1960 model year.

Lincoln and American Motors already are using similar single unit construction for their cars. The main difference between the Lincoln and the AMC method is in the front fender mounting—Lincoln welds its front fenders, while AMC bolts its to the body.

But Chrysler Corp., General Motors and the balance of the Ford Motor Co. have been studying various forms of unit construction. Since the single unit system used by Lincoln and AMC would involve expensive and perhaps difficult plant conversions, a platform frame variation is being looked on with favor. In this system, which Volkswagen, Porsche and some other foreign cars are using, the body is bolted to a platform frame to form the shell.

Another variation under study is the bolt-on front end, in which the front suspension and engine are bolted to an extra-rigid fire wall. One variation combines the platform frame with this method.

The major problem is still plant conversion, but the platform frame would lend itself to the easiest retooling, since a body drop still would be employed. GM, with its B-O-P assembly set-up, might have the toughest problem in converting. Ford Div. might find the task a little easier.

U.S. Small Car Programs Bustle As Import Registrations Jump

While registrations of foreign cars — mostly small cars — are climbing fast, U. S. manufacturers are busily pushing engineering programs toward small cars of their own.

In the first nine months of 1957, registrations of imported cars increased 111 per cent. September showed an even greater gain—180 per cent over last year. The total foreign car registration for the nine months topped 144,000. A large majority of the imports fall in the "small" category of 100-in. wheelbase.

Of course, AMC is ready to market its 100-in. wheelbase Rambler American after Jan. 1. But other companies are pushing their own projects, and in at least one case, the engineering budget and schedules have been rearranged to facilitate this kind of planning.

Ford already is selling its English-built Ford cars in this country through specified dealers. But the English Fords are designed and engineered in Dearborn, and designing and tooling for a U.S.-made small Ford could involve a relatively simple program of interchangeable parts. Ford reportedly could be ready with this small car prior to 1961.

Chrysler is still shopping for a connection with a foreign manufacturer. The company is interested in obtaining overseas manufacturing facilities for a small car so it can make a bid for a larger share of the world market (where its present models have proved too bulky), as well as the home market.

One of the cars Chrysler is said to be considering is the Borg Ward Isabella, which measures 172.8 in. overall and has a 4-cylinder, 91 cu-in., 60-hp engine.

Seiberling Predicts Record Sales and Earnings in 1957

J. P. Seiberling, president of Seiberling Rubber Co., predicts record sales and earnings for his company in 1957. A fourth-quarter sales boost and good sales of passenger car replacement tires, should boost earnings to $1,150,000 for 1957, compared with $1,051,000. Sales should total about $47 million—up from last year's $46.6 million—Mr. Seiberling told a recent company meeting in Dallas.

During the coming year, capital spending will drop about 15 per cent, he added, from the nearly $1 million expenditure in 1957.

New Diesel Engine Introduced In U. S. by British Company

A high-speed, lightweight Diesel engine for small agricultural, marine and industrial equipment has been introduced to the American market by Petters, Ltd., of England.

D. K. Fraser, managing director of Petters, said the new engines—designated the PC series — range in weight from 243 lb for the single-cylinder PC-1 to 503 lb for the four-cylinder PC-4, largest in the series. Horsepower output is 6.25 for the PC-1 and 25 for the PC-4.

The two cylinder PC-2 weighs 329 lb and develops 12.5 hp; the three-cylinder PC-3 weighs 439 lb and develops 18.75 hp.

All models in the series operate at a constant speed of 3000 rpm, more than 1000 rpm faster than comparable Diesel engines, Mr. Fraser said.

U.S. Rubber to Produce Tires for Foreign Cars

United States Rubber Co. has announced plans for domestic production of tubeless tires for imported automobiles.

The tires will range from 13 to 16 in. in diameter and will fit 85 per cent of the imported car makes, the company said. These makes account for 95 per cent of the foreign car replacement tire market.

At present, the rubber company is supplying tires on a limited basis to dealers selling the English Ford, Vauxhall and Opel, and the Swedish Volvo from stock of its British subsidiary, North British Rubber Co.,

Crucible Steel Acquires Rem-Cru Titanium, Inc.

Crucible Steel Co. of America has acquired full ownership of Rem-Cru Titanium, Inc., which was jointly held by Crucible and Remington Arms Co.

Explaining the move, Joel Hunter, Crucible president, said, "It has become increasingly evident that the titanium business can best be conducted as a part of the specialty steel business. Plant facilities for production of titanium are virtually identical with those required for stainless and other specialty steels and alloys in which we are interested, and there are many things in common in marketing and research activities."

Rem-Cru has plant facilities adjacent to Crucible's works at Midland, Pa. It produces titanium ingots, slabs and billets which are processed into sheets, bars, wire and other mill products, chiefly in Crucible plants.

A TABLOID

General Motors research engineers report that they have reduced oxides of nitrogen in automotive exhaust by as much as 90 per cent with a "maximum performance carburetor" that provides a rich air-fuel mixture for all driving conditions.

* * *

Eaton Mfg. Co. claims that it has increased the life of its axle shafts by as much as 600 per cent, through use of a new method of induction hardening that heats the periphery of a shaft to any desired depth, leaving the core undisturbed.

* * *

The Air Force has set up an information center at Battelle Memorial Institute, Columbus, O., that will act as a clearing house for data on the effects of nuclear radiation on materials and systems that may be installed in nuclear-propelled aircraft.

* * *

Armour Research Foundation reports that it is adding more sponsoring companies to its ETOG program, which it launched in 1956. Under the program, a team of five ARF technologists, with headquarters in The Hague, Netherlands, keeps participating companies posted on European technological developments that may have value in American markets.

* * *

National Association of Manufacturers has donated more than 350 prints of its film series, "Industry on Parade," to the Library of Congress.

* * *

A 250-ton heat of alloy steel has been degassed successfully by vacuum stream degassing equipment designed and engineered by F. J. Stokes Corp. This heat is said to be more than 100 times larger than the heat that can be handled by the largest vacuum induction-melting furnace known to be in existence today.

* * *

Army tests show that titanium and its alloys are not harmful to lubricants as compared with other bearing metals and alloys, which act as catalysts to speed up oxidation or chemical decomposition of greases and oils.

Du Pont Co. reports that it has spent more than $15 million this year on basic research, and that more than 400 Du Pont scientists are currently engaged in the search for scientific knowledge without regard to specific commercial uses.

* * *

Multiple roll forming, a specialized production technique which makes it possible to laminate stainless over other types of steel, is being used in the production of some 1958 model cars, according to the Committee of Stainless Steel.

* * *

Armour Research Foundation spent more than $14 million during the 1956-57 fiscal year on a record 734 research projects—404 for industry and 330 for Government.

* * *

Calumet Steel Div. of Borg-Warner Corp. is launching a multimillion dollar expansion and improvement program at its Chicago Heights, Ill., facilities. When the program is completed Calumet, which has been in the business of rerolling rails and axles, will become a combination new billet and rerolling mill.

* * *

Pacific Div. of Bendix Aircraft Corp. says it has developed a sonic cleaning tank for the Air Force that cleans jet engines with high-frequency sound waves in a fraction of the time normally required.

* * *

Tubular Products Div. of Babcock & Wilcox Co. plans a $12-14 million expansion and modernization program that includes the addition of a new electric arc furnace and associated equipment.

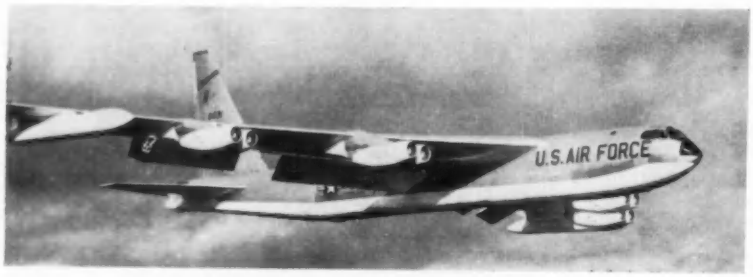
* * *

Army Engineers have broken ground at Fort Belvoir, Va., for the first closed-cycle gas turbine test facility in the U. S. Knowledge gained there will be used to design a mobile gas-cooled nuclear power plant for military use.

* * *

North American Aviation, Inc. reports that over 85 per cent of its total outside purchases of materials, parts, subcontracts and services during the 1957 fiscal year were made from 10,350 small business firms.

AVIATION MANUFACTURING



New model of B-52 is shown taking off on test flight

Boeing Is Now Producing Improved Model of B-52

A new model of the Boeing B-52 Stratofortress has entered service with the Air Force Strategic Air Command.

The new model, designated B-52E, has the same outward appearance as its predecessor, but is equiped with new bombing, navigation, and electronic systems. The B-52E is being produced by both the Seattle and Wichita Divs. of the company, and will go into regular service as America's front-line, long range heavy bombardment weapon.

Like preceding models, the eight-jet Stratofort has a range of more than 6000 miles without refueling, a speed of 650 mph, and an operational altitude of more than 50,000 ft.

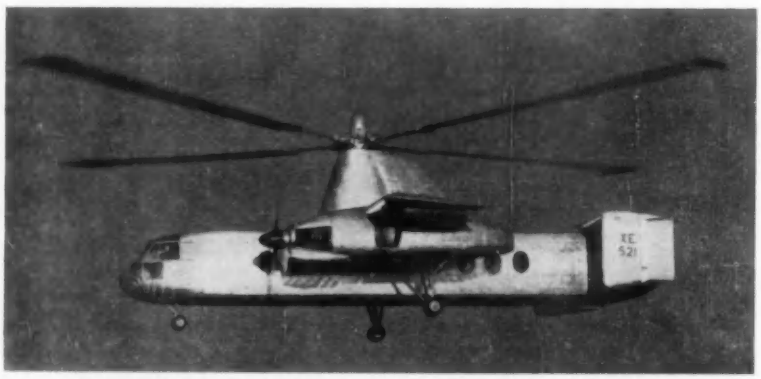
Martin Forms a New Division To Speed Satellite Launching

Martin Co. has formed a new division to speed on-the-spot arrangements for launching both the Navy satellite and the Air Force ICBM.

George M. Bunker, Martin president, announced that G. T. Willey has been appointed vice-president and general manager of the new division, which will have equal status with the company's Baltimore, Denver, and Orlando divisions. Mr. Willey will have charge of all Martin activities in the Patrick Air Force Base and Cape Canaveral area, including continued testing of the Matador Tactical Missile, Mr. Bunker said.

Martin is the prime contractor for the earth satellite's 3-stage launching rocket.

The schedule for the Vanguard program announced by President Eisenhower and the Navy calls for launching this month of the first test vehicle, which will contain a baby satellite; three additional launchings during the winter of test vehicles containing similar baby satellites; and launching of the first fully instrumented 22½ lb satellite vehicle in March, 1958.



FIRST VERTICAL TAKE-OFF AIRLINER FLIGHT-TESTED

The Fairey Rotadyne, which was successfully flight-tested in Britain, takes off vertically as a helicopter, then cruises on its fixed wing. The two Napier Eland turboprop engines supply compressed air through the hollow rotor blades, and this is burned with fuel in the tip jet units. At operative height, engine power is transferred to the forward-facing propellers and the Rotodyne then flies forward as a conventional aircraft with the rotor auto-rotating to provide additional lift. The sequence is reversed for vertical descents. Top speed of the machine is nearly 200 mph, and it can carry 48 passengers or 41 tons of freight in 400-mile stages.

Lockheed Acquires Machine To Speed Model Construction

A machine that will whittle out the world's fastest winged shapes with micrometric precision has been acquired by Lockheed Aircraft Corp.

The device—the Whaley over-arm wing contour machine—is one of only four in existence. It fashions lift surfaces of wind tunnel models from all metals, including the hardest of all—heat-treated steel.

J. B. Wassel, California Div. director of engineering, said the machine will speed model construction nearly 40 per cent. Steel has supplanted wood and aluminum in making model parts—wings and empennages—which encounter extreme stress and strain, Wassel explained.

The Whaley machine was developed and designed at the National Advisory Committee for Aeronautics, Langley Air Force Base, Va. It works steel with a minimum of template guidance at tolerances down to 0.003 in., eliminating long and costly hand carving used in previous contouring methods.

Pure Niobium and Alloys Being Produced by Du Pont

Niobium metal of unusual purity and niobium alloys possessing high strength at high temperatures have been developed by Du Pont to help

solve critical design problems in jet engines, guided missiles, and atomic reactors.

In a move to step up progress of the metal, Du Pont announced that it has entered into an agreement with Thompson Products, Inc., under which that firm will develop forging and other fabrication techniques for the Du Pont system of alloys. Thompson Products is a leading producer of jet engine parts and other aircraft components.

Du Pont will supply niobium alloys to Thompson Products and will coordinate its research on alloys with Thompson's development program.

Boeing 9-Month Sales Total Over $1 Billion

Sales totaling $1,068,149,816 for the first nine months of 1957 were reported by Boeing Airplane Co. Net earnings were $24,077,427, a return of 2.25 per cent on sales.

For the like period in 1956 sales were $671,628,399 and net earnings $22,971,285. The company attributed the lower profit margin to the increased write-off of expenses applicable to the commercial program and to reduced gross profit margins on incentive-type fixed price contracts.

The company also reported unfilled orders to Sept. 30 totaled $2,533,000,000, compared with $2,836,000,000 on June 30. Orders for commercial jet aircraft amounting to $702 million are included in this backlog.

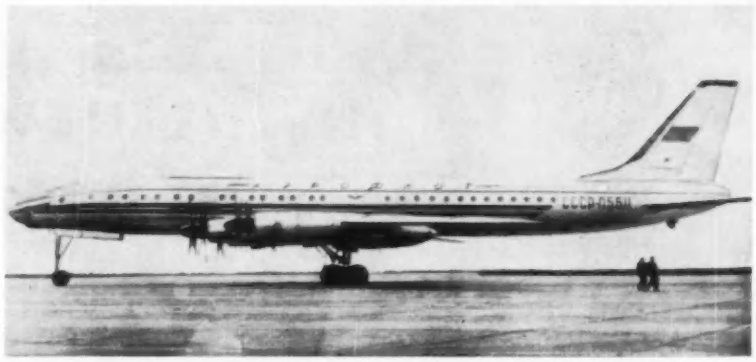
Lockheed 9-Month Sales Establish New Record

Nine-month sales of Lockheed Aircraft Corp. totaled $645,727,000, highest in company history for a like period.

Record commercial deliveries and expanding missile business helped increase total sales 26 per cent above the $514,433,000 recorded in the comparable period last year.

The Lockheed report, issued jointly by Robert E. Gross, chairman of the board and chief executive officer and Courtland S. Gross, president, listed net earnings for the period as $11,311,000, compared with $10,844,000 for the same period last year.

The company's backlog on Sept. 29 was $1,286,163,000, down 19 per cent from a year ago and 8 per cent from midyear. The company said this decrease reflected heavy deliveries and sharp reductions in Government defense spending.



RUSSIAN AIRLINER CAN CARRY 220 PASSENGERS

Russian airliner, called the TU-114, has four turboprop engines and can carry as many as 200 passengers. On external routes, the huge craft can carry 120 passengers and fly non-stop from Moscow to New York in 12 hours. Its engines are claimed to be twice as powerful as any others now in existence.

AF Missile Testing Program Is Biggest in History

The biggest problem still facing U. S. scientists working on long-range ballistic missiles is to achieve greater reliability in missile components, says the chief scientist of the Air Force ballistic missile program.

Dr. Simon Ramo, executive vice-president of Ramo-Woolridge Corp., the company charged with technical direction of the Air Force ballistic missile program, told the Mid-America Electronics Convention recently that the Air Force is making "astonishingly rapid headway" in solving this problem.

To achieve reliability, he said, the Air Force has created the most elaborate testing program in history, exceeding even the one required for the original atom bomb.

Explaining the testing process Dr. Ramo pointed out that every one of the some 300,000 components that go into an IRB or ICBM is first tested by itself. It is then fitted into a combination of, say, 75 or 750 components and then tested in combination.

Next, anywhere from 25 to 65 combinations are put in an assembly and tested. This is followed by a test of anywhere from 400 to 4000 assemblies, which comprise a subsystem that may contain as many as 60,000 separate components. Finally, the subsystems, holding some 300,000 components, are fused into the ballistic missile itself.

LOCKHEED ELECTRA ROLLS OFF ASSEMBLY LINE

First prop-jet Electra airliner rolls from Lockheed Aircraft Corp. final assembly lines in Burbank, Calif., full month ahead of schedule. A 400-mph transport designed for short-to-medium-range operations, the Electra is first U.S.-built commercial jet-and-propeller airliner. A total of 141 are on order from 10 world airlines, with first passenger service to begin next fall. Plane measures 99 ft from wingtip to wingtip, 104½ ft long, and will carry 66 to 91 passengers. It is powered by four Allison Model 501 prop-jet engines for a total of 15,000 hp.

MEN IN THE NEWS

Binks Mfg. Co. — John Baur was appointed director of engineering and research.

Standard Oil Co. (Indiana)—**George W. Watts**, director of engineering and engineering research, has retired, and **Fred W. Scheineman** was named director of engineering; **Thomas A. Abbott**, engineering administration manager; **Robert B. Jacobs**, engineering research manager; and **George M. Keranen**, general engineering department manager.

Ford Motor Co.—**V. Y. Tallberg**, special assistant to the vice-president —engineering and research, has retired, and **A. L. Haynes** has been named director of the engineering research and advanced product study office, engineering staff.

Chrysler Corp., Marine & Industrial Engine Div.—**Arthur S. Hudson** was appointed president.

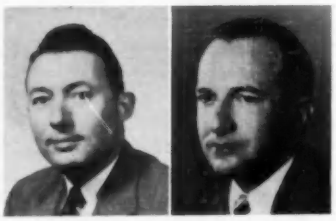
Allis-Chalmers Mfg. Co. — **E. J. Mercer**, **P. F. Bauer**, and **William M. Wallace** were elected vice-presidents.

Sundstrand Machine Tool Co.—**Don W. Branning** has become manager of the American Broach & Machine Div.

Austin-Western Div., Baldwin-Lima-Hamilton Corp.—**Robert H. Diller** has been appointed advertising manager.

Bearings Co. of America Div., Federal-Mogul-Bower Bearings, Inc. — **Howard W. Ludwig** has been named sales manager.

Dodge Div., Chrysler Corp.—E. W. Engle was named production control manager.



Norton Co.—W. Alexander McCune, Jr., has become manager of field sales, and Robert Cushman was named manager of marketing services.

Automatic Molding Machine Co.—**P. H. Richey** was named president and treasurer; **F. M. Mansfield**, vice-president in charge of sales; **Bruno Leonelli**, vice-president; and **Irvin Tochner**, vice-president in charge of operations.

Bendix Aviation Corp. — **E. O. Cooper** has been appointed general manager of Bendix West Coast sales and service.

A. O. Smith Corp. — **Samuel R. Brentnall** was appointed managerial consultant.

Phoenix Mfg. Co. — **Thomas H. Locke, Jr.**, has been appointed manager of the Steel Mill Div.

Oakite Products, Inc.—**Donald R. Dutton** and **George D. Findlay, III**, have been named technical service representatives.

Dow Chemical Co.—**J. R. Stein** was named general manager of Louisiana Div. facilities.

Armstrong Cork Co.—**Keith Powlison** has retired as vice-president and secretary.

Bethlehem Steel Co.—**C. E. Clarke** has retired and **C. T. Stott** succeeds him as general manager of the Sparrows Point, Md., plant.

R. K. LeBlond Machine Tool Co.—Harry C. Kemper has been appointed chief engineer.

Cleveland Cap Screw Co.—Thomas A. Fribley has been elected a vice-president.

General Tire & Rubber Co.—**William C. Weirath** is now manager of commercial tire sales.

Taft-Peirce Mfg. Co.—**Wendell F. Carney** has been appointed general sales manager.

Clevite Harris Products, Inc.—**Dan T. Bradley** has been named vice-president and technical advisor, and **Frank S. Treco, Jr.**, has been appointed general sales manager.

Westinghouse Air Brake Co.—**Edwin Hodge, Jr.**, was elected chairman of the board.

Douglas Aircraft Co.—**F. W. Conant** was elected vice-chairman of the board; **Donald W. Douglas, Jr.**, president; and **Ira C. Eaker**, vice-president in charge of eastern offices.

Necrology

Gerard Swope, 84, former president of General Electric Co., died Nov. 20, at New York City.

J. A. Neath, 61, chairman of Humble Oil and Refining Co., died Nov. 16, at Houston, Tex.

Horace E. Haring, 62, electrochemical specialist at Bell Telephone Laboratories, died Nov. 12, at Summit, N. J.

Thomas Robins, 89, founder and former chairman of Hewitt-Robins Co., died Nov. 4, at Stamford, Conn.

Hugh R. Brown, 59, maritime merchandising manager for General Motors, Ltd., died Nov. 11, at Moncton, New Brunswick.

Edgar O. Landstrom, 58, secretary of Sundstrand Machine Tool Co., died Oct. 31.

The Kelsey-Hayes Co., Vernon, Calif., has used *Texaco Soluble Oil* emulsions in these Bullard Vertical Lathes for more than four years. They report that Texaco emulsions have demonstrated greater rust protection than previously used products, and have eliminated unpleasant "Monday morning odor."

Even at high dilutions *Texaco Soluble Oils* protect parts from rust

Next to good emulsification properties, *rust prevention* is most important in a soluble oil emulsion. And, while all soluble oil emulsions provide *some* protection, *Texaco Soluble Oils* contain rust inhibitors designed for *full protection* against rust, even at very high dilutions.

What's more, *Texaco Soluble Oil* emulsions combine good cooling capacity with anti-friction properties. They mix readily, form stable emulsions, and resist the formation of objectionable odors. And in grinding, they allow dirt to settle out quickly, keep wheels free-cutting longer. These are good reasons why modern *Texaco Soluble Oils* are successfully used for all but the toughest of machining operations.

Let a Texaco Lubrication Engineer give you more details about the full line of Texaco cutting fluids. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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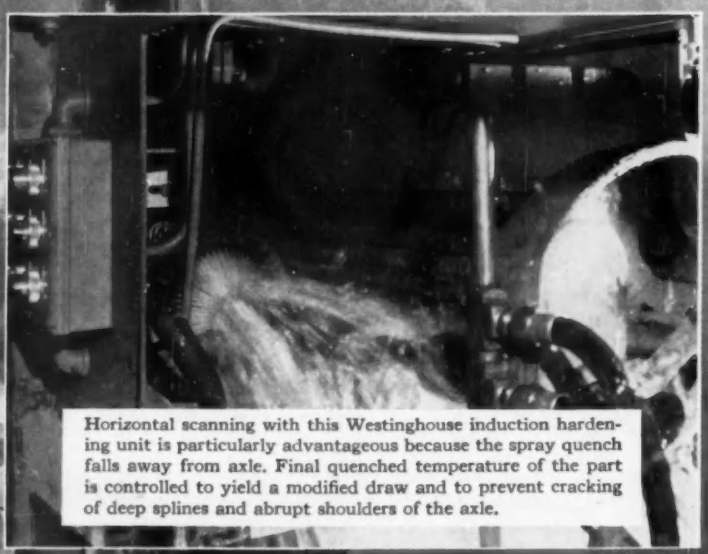
WHAT'S HAPPENING AT



Horizontal scanning with this Westinghouse induction hardening unit is particularly advantageous because the spray quench falls away from axle. Final quenched temperature of the part is controlled to yield a modified draw and to prevent cracking of deep splines and abrupt shoulders of the axle.

PRODUCT AND **PROFIT** IMPROVEMENT

OLIVER CORPORATION?

They are Saving More Than $1.00 per Axle ... with Westinghouse Induction Heating!

Here's really important news to everyone in metalworking. At Oliver Corporation, Charles City, Iowa, plain carbon steel is automatically heat treated to meet strength specifications . . . one operator takes care of automatic scanning, rapid heating, controlled quench . . . and the Westinghouse Induction Heating units are adjustable to accommodate eleven types of axles. In addition to savings of more than $1.00 per axle because the Westinghouse units made possible the change from an expensive alloy steel to plain carbon, Oliver Corporation cites many other advantages.

They say that with Westinghouse Induction Heating there is less distortion, therefore faster operation . . . 100% better control of case depth and many savings from the standpoints of operating and manufacturing. According to the Oliver Corporation, the Westinghouse Induction Heating units have "revolutionized our methods of heating."

PUT YOUR HEATING ON A PUSHBUTTON PRODUCTION LINE BASIS

For hundreds of plants, Westinghouse engineering has produced integrated induction heating equipment which is successfully handling highly specialized metallurgical and production requirements. Westinghouse Induction Heating can put the *exact* heat you want *exactly* where you want it—day after day, week after week, without variation.

YOU CAN BE SURE...IF IT'S Westinghouse

This Westinghouse Induction Heating unit at the Oliver Corporation is adjustable to accommodate eleven different types of axles. Attended by one operator, the Westinghouse unit handles 260 to 300 axles per 16-hour day.

WITH WESTINGHOUSE INDUCTION HEATING

BUT MAYBE INDUCTION HEATING IS NOT FOR YOU...LET'S FIND OUT

Telephone collect EDmonson 6-2300, or return this coupon to SALES MANAGER, Industrial Electronics Dept., Westinghouse Electric Corporation, P. O. Box 416, Baltimore 3, Maryland.

I believe that we qualify for Westinghouse Induction Heating. _____Please have your engineer call. _____Please send literature. We make_____(item) from_____ (metal or alloy). Each piece is approx._____(size) and weighs approx._____. We work in temperature range of_____and handle approx._____ per hour. We are interested in: _____Forging _____Hardening _____Joining _____Other.

Please describe briefly_____

_____

_____

Please check below the Westinghouse Induction Heating advantages you believe are superior to your present process.

_____Selective heat _____Safety
_____Instantaneous heat _____Consistent results
_____Minimum scale _____Production-line heating

Name_____Title_____

Company_____

Street & No._____

City & State_____

J-35002

A hose that takes extremes of heat and cold without cracking; attachable tire sidewall rings in white and a variety of colors for *extra* beauty in today's cars; and boots with superior resistance to weather and wear . . . all through the use of Enjay Butyl.

Enjay Butyl—*today's colorful rubber*

combines endurance and appearance for consumer products

With its versatility proved in a wide variety of industrial applications, Enjay Butyl is now making news in the field of consumer products. Available in non-staining grades for white and light-colored applications, it is helping manufacturers to market new products of *outstanding* durability in a wide range of attractive colors.

Where can Enjay Butyl work for *you?* Low in cost and immediately available, it may well be able to *cut costs* and *improve the performance* of *your* product. Enjay's newly expanded laboratory facilities, fully staffed by trained technicians, are always ready to help you find new applications for Enjay Butyl. For further information, contact the Enjay Company.

ENJAY BUTYL

Enjay Butyl is the greatest rubber value in the world. It's the super-durable rubber with outstanding resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

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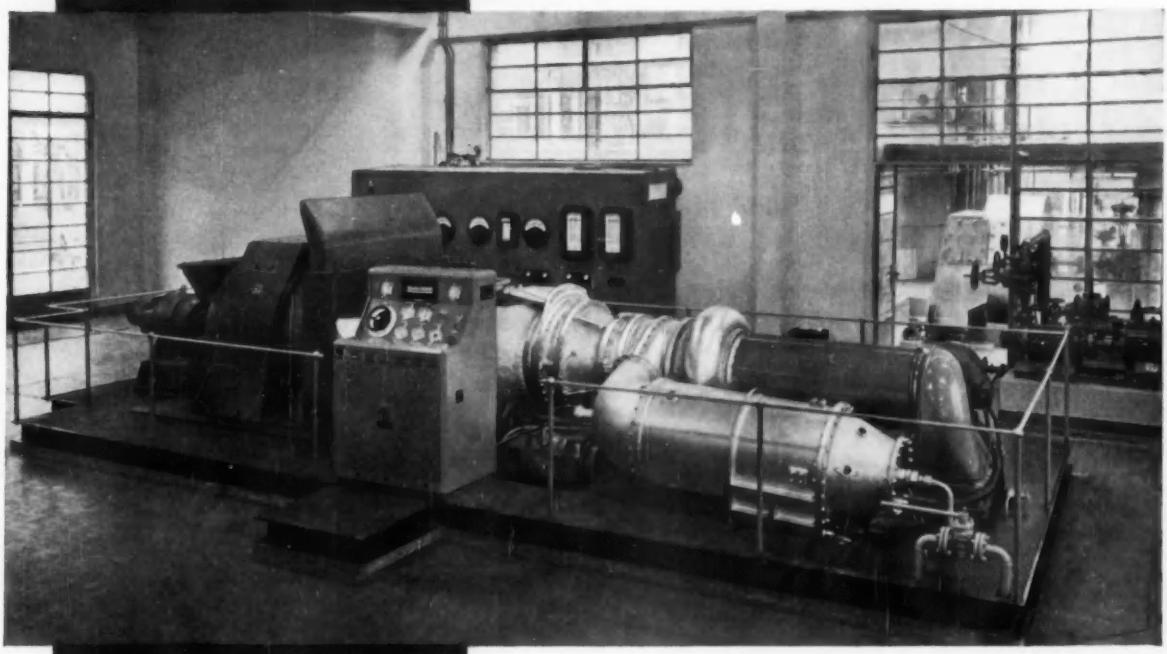


The Mark TA gas turbine generating power and process steam in a refining application.

all power services in one package

In applications where multiple power services are required such as power generation, compressing, pumping, space heating, refrigeration, air conditioning, drying, or evaporating, the Clark Mark TA gas turbine is the economical choice.

Exhaust gases from this 1,150 bhp. gas turbine contain up to 10,000,000 BTU/H of recoverable energy at a temperature of 870°F. While these gases contain some products of combustion, 90% of the original oxygen content is still present.

The exhaust gases are useful where preheated air is desirable for combustion or supercharging purposes, for drying applications, catalyst regeneration, feedwater heating, evaporation of sea water, etc. These gases can also be used in air to air heat exchangers for space heating or to generate up to 9,500 pounds of low pressure steam per hour for process use. If even higher temperature gases are required, the Mark TA can be used solely as a power gas generator to provide gases of 1020°F at 20-22 psia. and a mass flow of 20 pounds per second.

For large stores, auditoriums, hotels, hospitals and office buildings, the Mark TA can provide approximately 1800 tons of air conditioning or refrigeration in the summer using the absorption cycle and also provide steam for heating in the winter. In all applications except power gas generating, this modern gas turbine also supplies 1,150 bhp. of rotative energy for pump, generator, or compressor drive.

Clark engineers stand ready to assist you in applying the Mark TA gas turbine to your application. Larger units with ratings of 9,500 bhp. are also available from Clark. Write for Bulletin No. 142.

CLARK BROS. CO., OLEAN, N.Y.
One of the Dresser Industries
Offices in Principal Cities Throughout the World

Clark Bros. Co. is licensed to manufacture the Mark TA gas turbine in this country by Ruston-Hornsby, Ltd., Lincoln, England.

CLARK

XXIV

This is the twenty-fourth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Quenching and Tempering Alloy Steels

Of the various methods of heat-treating alloy steels, the most important is that involving quench and temper. This method, which enhances the mechanical properties of the end product, differs materially from normalizing and annealing (previously discussed in this series).

The purpose of quenching is to effect a cooling rate sufficient to develop the desired hardness and structure.

Before quenching takes place, steel is heated to a point above the transformation range. Quenching is the subsequent immersion of this heated steel in a circulated or agitated bath of oil, water, brine, or caustic; or, in the case of austempering or martempering, generally in agitated molten salt baths. Austempering and martempering are preferable where a minimum of distortion is desired.

Quenching *increases* the tensile strength, yield point, and hardness of alloy steels. It *decreases* ductility —that is, elongation and reduction of area. It also decreases resistance to impact. However, by means of tempering, it is possible to restore some of the ductility and impact-resistance—but only at a sacrifice of tensile strength, yield point, and hardness.

The results of mild oil- or water-quenching as related to mass effect can be found in the end-quench hardenability test. Voluminous data concerning this test are issued by AISI and SAE in the form of hardenability bands for the various grades of alloy steels.

If thermal cracking is to be avoided, cooling by liquid quenching should not be carried to a point below 150 deg F. When a temperature of 150 deg F is approached, immediate tempering should follow. Because of residual stresses, no steel should be used in the as-quenched condition.

Tempering can be defined as reheating to a specified temperature below the lower critical range, followed by air cooling. It can be done in furnaces, oil, or salt baths, the temperatures varying from 300 to 1200 deg F. With most grades of alloy steel, it is best to avoid temperatures between 500 and 700 deg because of the "blue brittleness" that occurs in this range. Maximum hardness and wear-resistance result from tempering at low temperatures; maximum toughness is achieved by tempering at the higher levels. Of course, one of the essential reasons for tempering is to relieve the residual stresses set up in quenching.

Bethlehem metallurgists have devoted years of study to quenching, tempering, and other phases of heat-treating. By all means call them if they can be of service to you. And please remember, when you are next in the market for alloy steels, that Bethlehem makes all AISI standard grades, as well as special-analysis steels and the full range of carbon grades.

If you would like reprints of this series of advertisements from No. I through No. XX, please write to us, addressing your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa. The first 20 subjects in the series are now available in a handy 36-page booklet, and we shall be glad to send you a free copy.

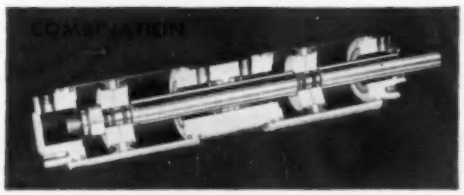
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

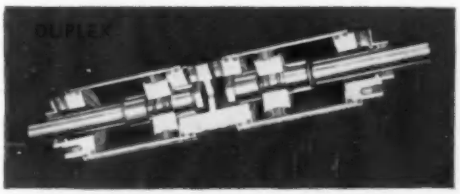
BETHLEHEM STEEL

O-M Design Assures Maximum VERSATILITY

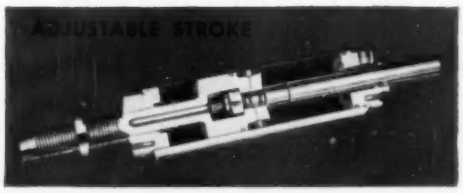
The O-M Internal key-type cylinders are not only the most compact, streamlined and efficient cylinders on the market today; but they also easily lend themselves to modification. Using a majority of standard parts and one or two semi-standard parts, you get the advantages of "special" cylinders designed to do your job better at a very nominal extra over standard cylinder prices. Here are only a few of the combinations available.



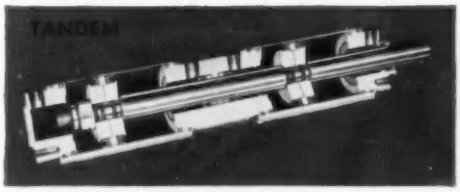
The economy and ease of air operation can be teamed up with the precision of hydraulic speed control. This can be accomplished with the O-M Air-Hydraulic combination cylinder by merely metering the oil flow between the ports of the forward cylinder of the unit.



The duplex cylinder is "just the ticket" for the application where movement takes place in opposite directions in the same plane. Both piston rods may be extended or retracted simultaneously, or independently. Also available with common center port.



Often it is necessary to make frequent changes in stroke length on the same or different jobs on the same machine. This adjustment is easily accomplished with micrometer accuracy in only a moment's time.



When diametrical space is at a premium and the available pressure of the operating medium is low, the force can be almost doubled by the use of the tandem air or low pressure hydraulic cylinder.

Consult your O-M Representative or the factory for specific recommendations for your application. Use coupon for name of representative nearest you and copies of O-M standard cylinder catalogs.

SEND IN COUPON TODAY

ORTMAN-MILLER MACHINE COMPANY

17 143rd Street, Hammond, Indiana

☐ Have representative call

☐ Send Bulletins 101A and 105

Name_____ Position_____

Company_____

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Perspective of the 13-station Buhr Economatic transfer machine which performs the variety of operations on the front pump body detailed in the text.

Buick's Facilities for

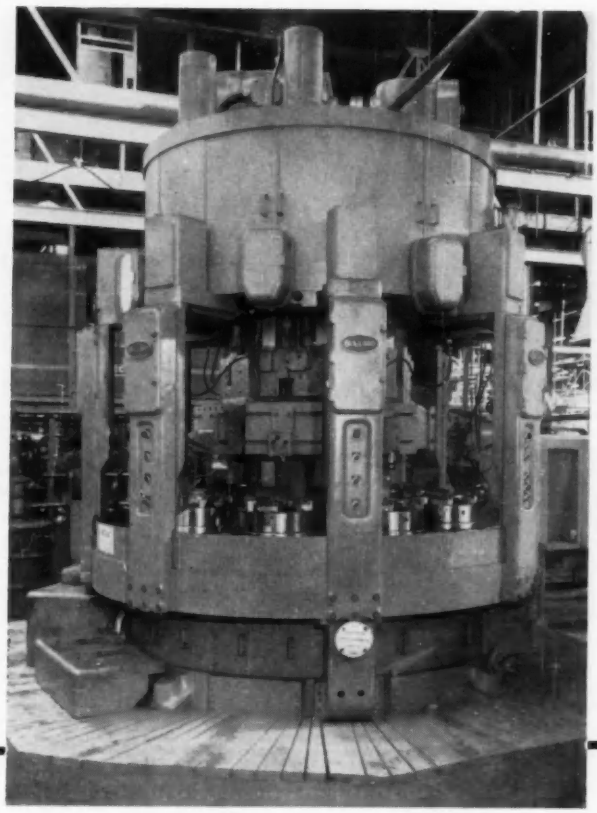
By Joseph Geschelin

IN launching the new Multi-Pitch Dynaflow for its 1958 line, Buick Motor Division has installed some outstanding facilities for the production of the many components. This article is concerned with a high-lighting of operations on three major parts: the one-piece aluminum transmission case, the aluminum rear bearing retainer (extension), and the cast iron front pump body. The case, one of the largest one-piece permanent mold castings in production today, also includes the valve body as part of the casting.

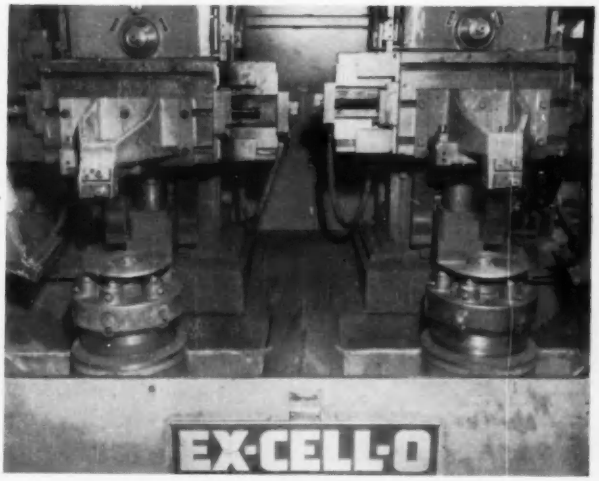
The machine line includes a 15-station Newton milling and drilling transfer machine; a 25-station Newton milling and boring transfer machine; a Greenlee 37-station pallet type transfer machine, and a Greenlee 22-station walking-beam type transfer machine. The last major series of operations is performed in a 6-station, walking beam type Heald Bore-Matic transfer machine. Washing of the case is handled in a special Centri-Spray unit equipped with a walking-beam type transfer system.

It is noteworthy that the finishing operations on the case in the Heald transfer machine as well as in the Centri-Spray washer are performed at a controlled temperature of 70 F to maintain standard conditions for gaging and assembly. In the case of the Heald equipment constant temperature conditions are maintained by means of a centralized coolant system provided with suitable refrigeration. In the case of the washer, temperature is held constant by refrigerating the circulating fluid. The same principle is carried out in the machining of the aluminum extension. This procedure effectively compensates for the greater coefficient of expansion of aluminum parts and assures maintenance of close dimensional tolerances.

The first stage of machining of the case is in the 15-station Newton transfer machine, doubtless the first of its kind made by this company. It may be noted that a number of stations are idle. This has been done deliberately to accommodate such product changes as may be expected to occur in time to come.



Preparatory operations on the front pump body are done in Type L, 14-in., 8-spindle Mult-Au-Matics.



Close-up of one of the Ex-Cell-O two spindle turning machines for operations on the front pump body.

OPERATIONS ON FRONT PUMP BODY

Multi-Pitch Dynaflow Production

The objective in this machine is to mill four locating lugs, drill four holes, ream two holes for locating purposes, and press-in two hardened and ground bushings into two of the lugs. The purpose of the operation is to provide extremely accurate locators for subsequent fixturing. All of the milling cutters are fitted with replaceable cemented-carbide inserts.

At the 14th station of this machine the part enters a turntable fixture for positioning for the roll-over station 15 which turns the part over and transfers it into the first station of the next machine.

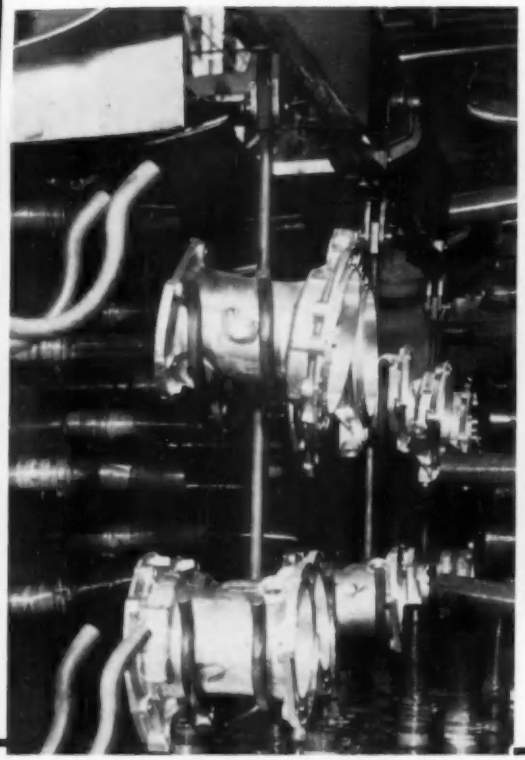
Rough-milling of the pan face, rough-facing of both ends, and rough-boring of both ends then is handled in a Newton special 25-station milling and boring transfer machine. Rough-milling of the large end of the case is done at Station 3, the small end being rough-milled at the opposite side of the station. These faces then are semi-finish-milled at Station 4. Similarly, the pan face is rough-milled at Station 7, semi-finish-milled at Station 8.

Rough-milling of a 48-deg angle mounting pad and adjacent face is done at Station 10, and repeated for a similar pad at Station 12. These pads are finish-milled at Stations 14 and 15. Several other individual milling operations are completed at succeeding stations.

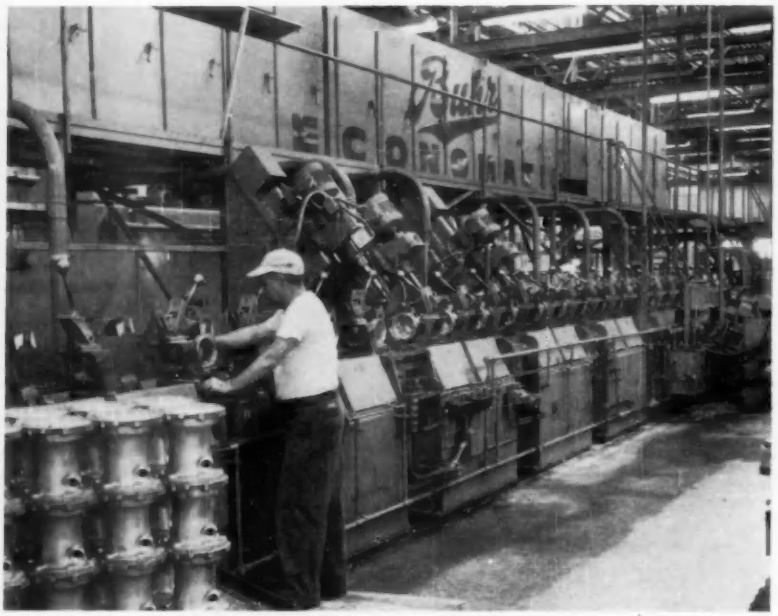
Boring operations begin at Station 22. These include rough-boring of step bores in the large end, rough facing of the bottom of a large bore. Station 23 completes the rough-boring.

The case now is transferred to the 37-station Greenlee pallet type transfer machine for producing a series of 96 holes. These operations include drilling, countersinking, and reaming, depending on the location. In many instances holes are drilled only part way through at a given station; completed at one or more succeeding stations.

At Station 26 LH, 25 holes are probed to verify proper depth and freedom from broken drills. Drilling continues at subsequent stations with tapping of 12 holes at Station 29 LH. Another probing station, this one handling 46 holes, is located at Station 32



Looking into the interior of one of the Centri-Spray machines used for washing rear bearing retainers. The work is held in the special hooks seen here, and transported on a monorail conveyor.



The 43-station Buhr Economatic transfer machine on the rear bearing retainer line. Note the massive, quick-clamping fixtures on individual pallets.

LH. Then 23 holes are probed automatically at Station 33.

Station 35 LH taps 17 holes; Station 36 RH taps 32 holes, six of these being a full-one-inch in depth.

The case then is unloaded at Station 37 and is transferred to the 21-station Greenlee, a walking-beam type transfer machine. Here is an extensive piece of equipment required for the handling of a relatively small number of special holes. It does the drilling of 14 holes; combination spotfacing and countersinking of 10 holes; reaming of two holes; tapping 10 holes. However, one of the holes is 1.160 in. in depth, another 2.290 in. deep; still another is 1.24 in. deep, while another is 0.1875 in. in diameter and 2.300 in. deep.

Probing of holes for subsequent tapping is done at Station 13 where six holes are probed; and at Station 14 where four holes are probed. The holes then are tapped at succeeding stations. The case is unloaded at Station 21 and transferred into a Centri-Spray washer.

The case now enters the six-station Model S Heald Bore-Matic, a walking beam type transfer machine for boring, turning, and facing operations.

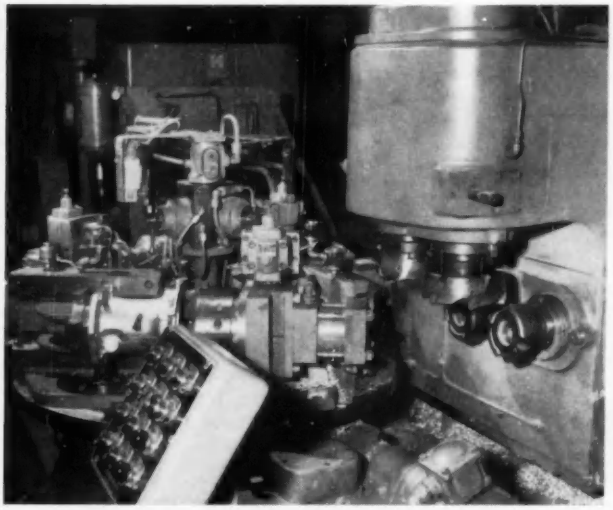
The first station finish-mills the previously milled pan face, holding the face to plus or minus 0.003 in. from the locating pads. This is done with a multi-tooth fly cutter. The second station semi-finish-bores three large bores and finish-bores one diameter. On the right hand side of the same station two large diameters are semi-finish-bored, while one diameter is finish-bored. In addition, this side of the station semi-finish reams two dowel holes.

At the third station, the left hand side semi-finish-faces the small end; while the right hand side semi-finish-mills the large bell end, holding 3.014 in. plus or minus 0.003 in., and holding the overall dimension to 22.305-22.315 in.

The fourth station, left hand, finish-faces the small end, finishes one of the steps, and finishes the snap ring groove. The right hand side finish-faces the large bell end. At the fifth station, the left hand head finish-bores three bores, holding a tolerance of ± 0.0005 in. on two of these. The right hand head finish-bores and faces one bore, finish-bores another, and finish-bore reams two small holes.

The sixth station finish-bore-reams three holes in the valve body face. The case is unloaded at this station, transferred to the Centri-Spray walking beam type transfer washing machine.

The Heald transfer machine as well as the last



Initial milling operations on the rear bearing retainer are handled in a Sundstrand, indexing type, four-station milling machine. This view shows the arrangement of the work station.

OPERATIONS ON REAR BEARING RETAINER

Centri-Spray washer are the units in which the work is held under close temperature control, as mentioned earlier.

At this point the cases are pressure tested for acceptance and inspected. Then they are transferred to a special Wheelabrator monorail type blasting machine for burring. Following this the case is washed in another Centri-Spray machine, making the third washing in this sequence.

Incidentally, it may be noted at this point that the Greenlee transfer machines are served by an installation of the familiar Scully-Jones Tooltrol consoles for tool maintenance and tool life calibration.

Consider now the sequence of operations in the machining of the rear bearing retainer or extension. The first operation is the milling of two bottom flanges and milling of two pads on the side of the flange in a Sundstrand, indexing type, four-spindle milling machine. Cutting is done with inserted blade face milling cutters, using cemented-carbine blades.

Rough-boring, turning, facing, and chamfering are handled in a battery of four Model S, slide-type, Heald Bore-Matics.

Next in line is a 43-station Buhr Economatic, a pallet type transfer machine for drilling, reaming, chamfering, and tapping all holes. This is another of the extensive transfer machines designed with sufficient stations to take care of product changes in the future and, as a consequence, it too represents a large number of idle stations in the present setup. Actually, it is required to drill 28 holes, ream one, tap 15 holes, countersink 13 holes, and combination spotface and chamfer two holes. However, a number of these holes are drilled part-way through in successive steps.

Drilling is interspersed with a fairly large number of individual probing stations. Thus 18 holes are probed at Station 11; 12 at Station 14; and one each at four other stations further down the line.

A 30-deg groove is formed at the small end at Station 15. The part is rotated automatically at Station 19 to present it in another direction; and rotated once more at Station 37. The work is unloaded at Station 42 with pallet return at Station 43.

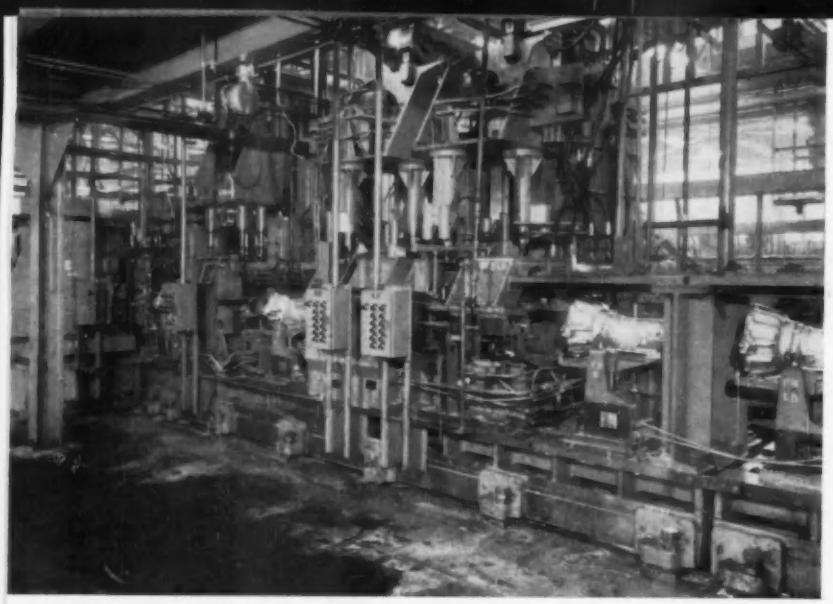
The extension then proceeds to a group of Model S Heald Bore-Matics for boring, turning, facing, and chamfering of both ends. It may be noted that the precision-boring operations as well as washing in the Centri-Spray machine are held to uniform temperature.

The third part to be covered here is the front pump body. Made of cast iron, it is quite similar in design to that used in the standard Dynaflow. However, the sequence of operations has been improved and simplified with the use of new items of equipment.

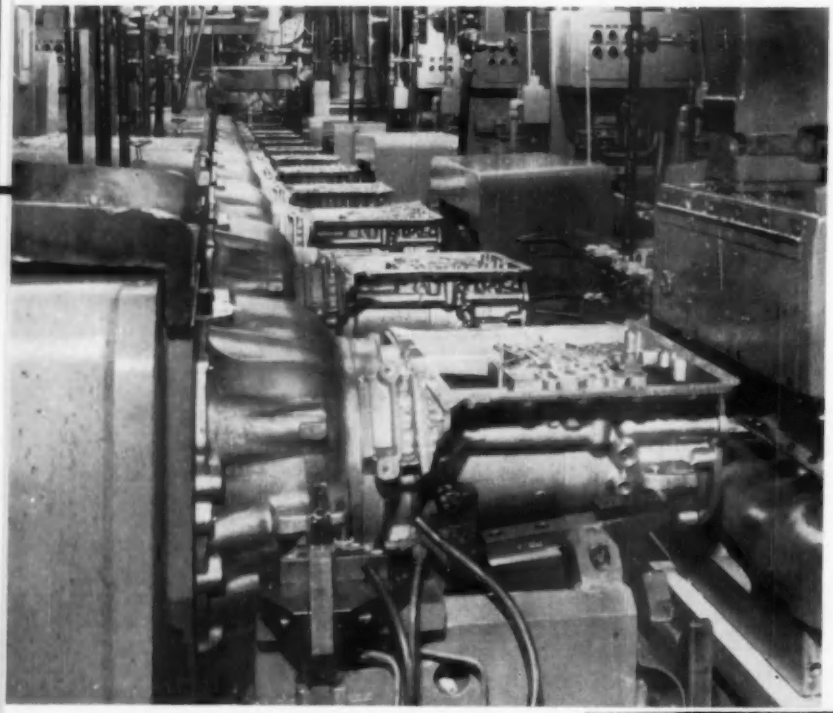
The special feature involved in the machining of this part lies in the development of a lunar section in the face together with a curved eccentric channel. It is necessary to hold concentricity of bores to close limits and the eccentric section must have the correct relationship with respect to the central bore. Consequently, it is necessary first to rough- and semi-finish the eccentric section, then provide the proper correction of radius and relationship with the central bore by precision-boring.

Preparatory operations from the rough are handled in two operations in Bullard Type L, 14-in. 8-spindle Mult-Au-Matics. The first series of operations includes boring, turning, facing, chamfering and reaming of one side. Then the part is transferred to another group of the same type machines for similar operations on the hub end. Semi-finish-turning on the OD and open face is done in Model 432, two-spindle vertical Ex-Cell-O machines.

The part now is transported to a 13-station Buhr Economatic transfer machine for a series of operations, including: drilling, reaming, chamfering, tapping, trepanning, etc. Following drilling, Station 3 does the combination spotfacing and countersinking of 10 holes; and spotmilling for an angular hole. The



One section of Newton transfer type milling machine on transmission case line.



A view of the special Heald Bore-Matic line. The transmission cases may be seen at the various stations, moving on the walking-beam conveyor transfer system.

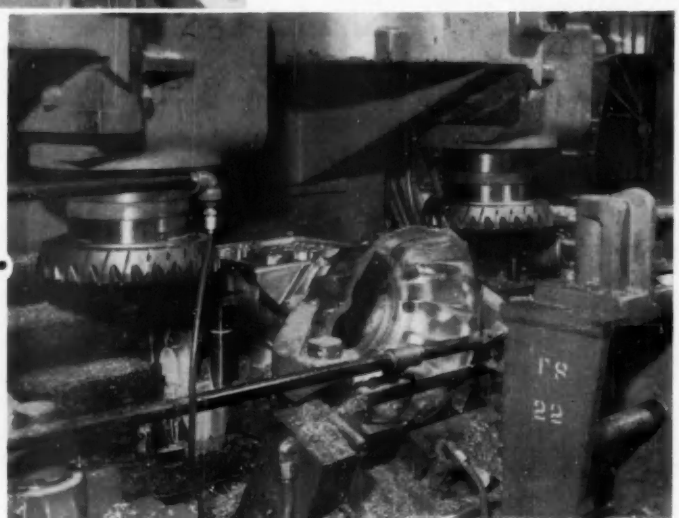
right hand head at this station drills seven holes to depth; spot-drills for chamfering two dowel holes. Station 4 LH drills an angular hole half-way.

The right hand head of Station 4 is a probe, checking a group of 17 holes and blowing out chips. Station 5 LH taps two holes and probes the angular hole. Station 7 LH semi-finish-bores the oil seal diameter, using an Ex-Cell-O head, while the right hand head probes seven tapped holes.

Station 9 RH rough-trepans the eccentric diameter and eccentric arc half-way while Station 10 RH completes the rough-trepanning. Finish-boring of the center bore is done at Station 11 LH, using an Ex-Cell-O boring head. Finally, the eccentric diameter and radius are semi-finish-trepanned at Station 12 RH.

Following pressure testing for soundness, the OD and open face of the part are finish-turned and finish-faced in a No. 432 Duplex Ex-Cell-O vertical precision-boring machine.

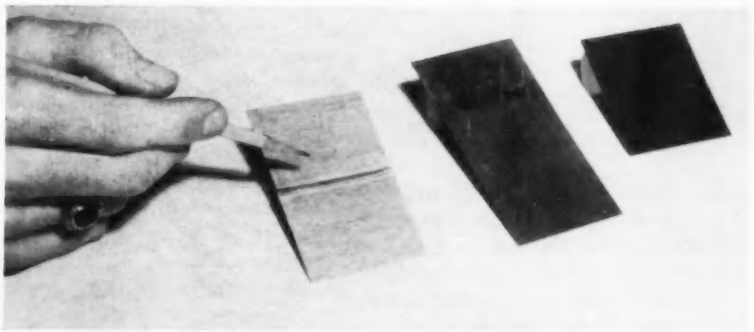
It should be emphasized that the foregoing is a summary of selected operations on the several parts. Numerous other operations are necessary in producing the part ready for installation on the assembly line.



One of the stations of the 25-station Newton transfer machine. Here may be seen the milling of the pan face.

OPERATIONS ON TRANSMISSION CASE

Practical Method for Removing Oxides from Molybdenum



Pencil points to molybdenum after final spray rinse. Dark piece at far right is molybdenum after first bath, center after second bath.

A PRACTICAL means for removing the oxides from molybdenum has been devised by the chemical laboratory at Ryan Aeronautical Co. The process involves two chemical baths, which satisfactorily remove all oxides without attacking the base metal. Because molybdenum is resistant to attack from aqueous alkaline solutions, the first bath consists of a deoxidizer with sodium hydroxide as its main constituent. By adding potassium permanganate to this solution, a very strong oxidizing bath was obtained.

Chemically, this bath converts the oxides of molybdenum to a higher valance state which is easily removed by a pressure spray rinse, leaving only a black smut on the surface of the base metal. The second bath, consisting of acids which do not attack molybdenum, removes this smut and produces a chemically clean surface.

Previous methods for cleaning molybdenum are not satisfactory either because they unduly attack the metal, are unsafe for personnel or possess other undesirable features.

One method used calls for a molten salt bath of 70 per cent sodium hydroxide and 30 per cent sodium nitrite, operating at a temperature of 500 to 700 F. This method of cleaning is hazardous to personnel because of the dangers in using molten salts. The bath attacks molybdenum and very close control is needed to prevent excessive metal loss. Losses up to three mils have been experienced with five-second immersions.

Following descaling of the molybdenum with molten salt, a bath consisting of concentrated sulfuric acid containing 3.5 per cent of a saturated sodium dichromate solution is used for chemical cleaning of the metal. The molten salt bath achieves descaling, but a secondary cleaning operation is usually necessary.

An anhydrous bath has been suggested, composed of 95 per cent sulfuric acid, 4.5 per cent nitric acid, and 0.5 per cent hydrofluoric acid, operated at 195 F. This bath is not completely satisfactory in its cleaning operation and it is difficult to keep the solution anhydrous.

A 25 per cent nitric acid, two per cent hydrofluoric acid by volume deoxidizing bath works quite well to remove the oxide, but readily attacks the molybdenum after the oxide has been removed. Electropolishing of molybdenum in 80 per cent sulfuric acid and 20 per cent phosphoric acid by volume has been tried, and although deoxidizing was accomplished, a great amount of metal attack was observed.

It is also possible to deoxidize molybdenum by mechanical means such as sandblasting or vaporblasting. However, this operation is not feasible on complex formed parts, because of the possibility of sand entrapment. And its high cost, which arises from the number of man-hours expended per part, often makes its use prohibitive.

The Ryan alkaline bath consists of 10 per cent sodium hydroxide, 5 per cent potassium permanganate and 85 per cent water by weight. The solution is kept at 150-180 F, with length of immersion time set at five to ten minutes.

The range of operation of this oxide-converting bath is quite wide, and is more dependent on the concentration of the sodium hydroxide than the potassium permanganate. At the present time, it appears that the ratio of sodium hydroxide to potassium permanganate cannot be less than two to one if an efficient bath is to be attained. The success of the bath comes from the formation of a highly oxidizing mangani-manganate complex which is formed from the reaction of the sodium hydroxide with the potassium permanganate. This complex can also be obtained if sodium hydroxide is fused with manganese dioxide, then dissolved in water.

The smut-removing bath is com-

(*Turn to page* 130, *please*)

A-c-c-e-l-e-r-a-t-e-d
SALT SPRAY TESTING of Plated Parts

By GEORGE L. SUKES
Senior Research Metallurgist
Department Head Materials Laboratory

CADILLAC MOTOR CAR DIV.
GENERAL MOTORS CORP.

THE need for a satisfactory accelerated test for evaluating the corrosion characteristics of plated parts has long been recognized by those responsible for plating quality. Just as in any other accelerated test, it must produce in the shortest possible time characteristics comparable to those of a part subjected to actual service conditions. In evaluating the corrosion characteristics of plated parts, it is recognized that the degree of corrosion achieved by an accelerated test will not be identical to that encountered in all areas of actual service. This can be attributed to the extremely variable conditions encountered in service. In dealing with corrosion of plated parts on automobiles for example, the extremely variable atmospheres of various localities, the salts used on streets to melt snow, atmospheric changes in a given locality and widely divergent extremes in owner care are all contributing factors. For these reasons the development of an accelerated corrosion test on plating should be designed to produce the same type of characteristic corrosion failure as that encountered in service. The degree of failure must be directly influenced by the time or duration of test. Test samples must be markedly influenced by known variables which affect plating quality. The test must accurately depict differences in the corrosion characteristics of the various plating quality; must be easily controlled; must be reproduceable; and as short as possible.

The Cadillac Motor Car Division recognized the short comings of the neutral salt spray test, its related specifications, and the need for a test which would better measure plating quality. With the start of production of the 1956 model, the acetic acid salt spray test was established as the means for evaluating plating quality. As a result, factors such as plating thickness, preparation of the base metal surface, buffing of intermediate layers of plating, design characteristics, alternation of metallic layers of plating, and the effect on corrosion of the final chromium deposit of a copper-nickel-chromium system of plating were readily uncovered and corrective action progressively taken. This action has reflected in plating quality improvements. In addition to these research investigations, a quality control program, based on acetic acid salt spray testing and plating thickness measurements, was established and maintained for each of the plated and anodized parts used on the exterior of the Cadillac automobile. These data can now be compared and evaluated against reported field failures. As the model year progressed it was apparent that there was one big disadvantage to the acetic-acid salt spray test, namely it was too time consuming. Each routine test was practically a research investigation in itself, because the individual test samples had to be evaluated and rated every 24 hours for eight consecutive days. Frequency of testing had to be reduced because test cabinets became overloaded and immediate corrective action was hampered because of the length of time required to complete corrosion tests. It was these factors which spured the investigation

TABLE I

PRELIMINARY EVALUATION OF SALT SPRAY TESTS

Accelerated vs. Acetic Acid

	TEST SOLUTION (NOTE 1)				VARIABLE TEST CONDITIONS		
Panel Code	Salt Conc.	Solution pH	Ferric Chloride	Cupric Chloride	Cabinet Temp.	Tower Temp.	Hours Test
2	5%	3.2	—	—	95°F	105°F	192
12	5%	2.0	18½ gm.	5½ gm.	95°F	105°F	30
11	5%	2.4	18½ gm.	5½ gm.	95°F	105°F	24
10	5%	3.2	—	5½ gm.	95°F	105°F	24
4	5%	3.2	—	5½ gm.	110°F	110°F	24
3	5%	3.2	—	5½ gm.	120°F	120°F	24
8	5%	3.2	—	5½ gm.	120°F	130°F	24
5	5%	3.2	—	5½ gm.	115°F	120°F	48

TABLE II

SALT SPRAY CORROSION STUDY TEST PANEL DATA

Test Panel Code	G. M. Spec.	Plating Code	Normal Salt Spray GM Spec. (Hours)	SPECIFIED PLATING THICKNESS Minimum (Inches) Copper	Nickel	Chrome	Total	ACTUAL PLATING THICK. Average (Inches) Copper	Nickel	Total
1-1	GM4251M	75	24	—	.0002	.00001	.00075	.0006	.0002	.0008
1-2	(Steel)	100	32	—	.0004	.00001	.0010	.0006	.0003	.0009
1-3		150	48	—	.0006	.00001	.0015	.0011	.0004	.0015
1-4		200	144	.0008	.0006	.00001	.0020	.0018	.0006	.0024
2-1	GM4251M	75	24	.0002	.0002	.00001	.00075	.0006	.0003	.0009
2-2	(Zn Die Cast)	100	32	.0003	.0003	.00001	.0010	.0006	.0004	.0010
2-3		150	48	.0003	.0005	.00001	.0015	.0011	.0004	.0015
2-4		200		.0014	.0006	.00001	.0020	.0010	.0006	.0016
3-1	GM4251M	100	32	—	.0004	.00001	.0010	.0008	.0004	.0012
3-2	(Aluminum)	150	48	—	.0005	.00001	.0015	.0008	.0006	.0014
3-3		200	144	.0008	.0006	.00001	.0020	.0016	.0006	.0022
3-4		300	216	.0008	.0007	.00001	.0030	.0026	.0008	.0034
4-1	GM4407P		48	Anodized	Clear		.0001			.0001
4-1	GM4407P		48	Anodized	Gold Dyed		.0001			.0001
4-2	GM4263P		96	Anodized	Clear		.0002			.0002
4-3	GM4273P		144	Anodized	Clear		.0003			.0003
4-3	GM4273P		144	Anodized	Gold Dyed		.0003			.0003
4-4	GM4261P		192	Anodized	Clear		.0004			.0004
5-1	GM4252M	10	8				.0001			.0001
5-2	(Steel & Zn)	20	32				.0002			.0002
5-3		30	40				.0003			.0003
5-4		50	48				.0005			.0005
6-1	GM4252M	10	8				.0001			.0001
6-2	(Steel & Cd)	20	32				.0002			.0002
6-3		30	48				.0003			.0003
6-4		50	48				.0005			.0005

TABLE III

METHOD FOR RATING PLATED SAMPLES TESTED BY ACCELERATED SALT SPRAY

Rating	Extent of Failure
100	No basic metal failure
96	1% of area failed
92	2% of area failed
88	3% of area failed
84	4% of area failed
80	5% of area failed
60	5-25% of area failed
40	25-50% of area failed
20	50-75% of area failed
0	75-100% of area failed

Specimens are checked at the end of the specified exposure period.

Evaluation of the extent of corrosion is critical.

For plated steel specimens the appearance of red rust signifies failure.

On plate zinc base die castings white corrosion products and blisters indicate failure.

On anodized aluminum pitting signifies failure.

Rundown of corrosion products must be disregarded in making the rating.

Cracks, peeling, plating mischromes, etc., may be observed diminishing or destroying the decorative effect of the plating, even though basic metal failure has not occurred. These factors shall be identified but not included in the rating.

and development of the "accelerated salt spray test."

A large number of preliminary tests were conducted by the Cadillac Materials Laboratory, with the objective of establishing a test which would in a 24 hour period produce results comparable to 192 hours of acetic acid salt spray testing. This preliminary screening indicated that variations which held the most promise of accelerating the salt spray test were additions of ferric chloride and/or cubic chloride to the salt solution and increased temperature in the fog chamber. The final screening of these modifications is shown in Table 1. As these tests progressed it was evident that ferric chloride could not be used in the acetic acid salt solution because the iron precipitated, deposited on test parts, clogged nozzles and made the test difficult to control. At this same time, it became evident that reduction of the PH of the salt solution below 3.2 produced corrosion on copper-nickel-chromium plated steel which characterized etching rather than the red rust failure produced on copper-nickel-

(*Turn to page* 113, *please*)

TABLE IV

RECOMMENDED ACCEPTANCE STANDARDS ON ANODIZING AND PLATING TO BE USED WITH ACCELERATED SALT SPRAY TEST

Test Panel Code	G. M. Spec.	Plating Code	Type Plating	Hours Accelerated Equal to 192 hrs Acetic	Hours Accelerated Minimum Acceptable	Hours Accelerated Desired Limits
1-1	4251M	75	Cu-Ni-Cr	48	6	12
1-2	(Steel)	100	Cu-Ni-Cr	48	12	24
1-3		150	Cu-Ni-Cr	48	24	48
1-4		200	Cu-Ni-Cr	48	36	72
2-1	4251M	75	Cu-Ni-Cr	24	3	6
2-2	(Zinc)	100		24	6	12
2-3		150		24	12	24
2-4		200		24	18	36
3-1	4251M	100	Cu-Ni-Cr	16	4	8
3-2	(Aluminum)	150		16	8	16
3-3		200		16	16	32
3-4		300		16	24	48
4-1	4407P	10	Anodize Clear	24	1	2
4-1	4407P	10	Anodize Gold	24	1	2
4-2	4263P	20	Anodize Clear	24	2	4
4-3	4273P	30	Anodize Clear	24	4	8
4-3	4273P	30	Anodize Gold	24	4	8
4-4	4261P	40	Anodize Clear	24	6	12
5-1	4252M	10	Zinc	48	3	6
5-2	(Steel)	20		48	12	+24
5-3		30		48	24	48
5-4		50		48	36	72
6-1	4252M	10	Cadmium	48	24	48
6-2	(Steel)	20		48	>48	>96
6-3		30		48	>48	>96
6-4		50		48	>48	>96

TABLE V

OPERATING CONDITIONS OF THE ACCELERATED SALT SPRAY TEST

Saturator Tower Temperature:
130 to 135 F

Salt Fog Chamber Temperature:
120 F plus 2 minus 1 F.

Fog Collection Rate:
1 to 2 ml per hour per 80 sq cm.

Salt Solution:
5 gallons of distilled water.
5% by weight Sodium Chloride.
5½ grams Cupric Chloride, $CuCl_2 \cdot 2H_2O$
pH 3.2 adjusted with glacial Acetic Acid.
Iron less than 0.0001%

Pontiac's Automatic Foundry

Automated Equipment Produces 2400 V-8 Engine Block Castings per Day

AFTER two years of automatic cylinder block production, the foundry staff at the Pontiac Motor Division, Pontiac, Mich., has proved that automation in their department is more than theory—it works.

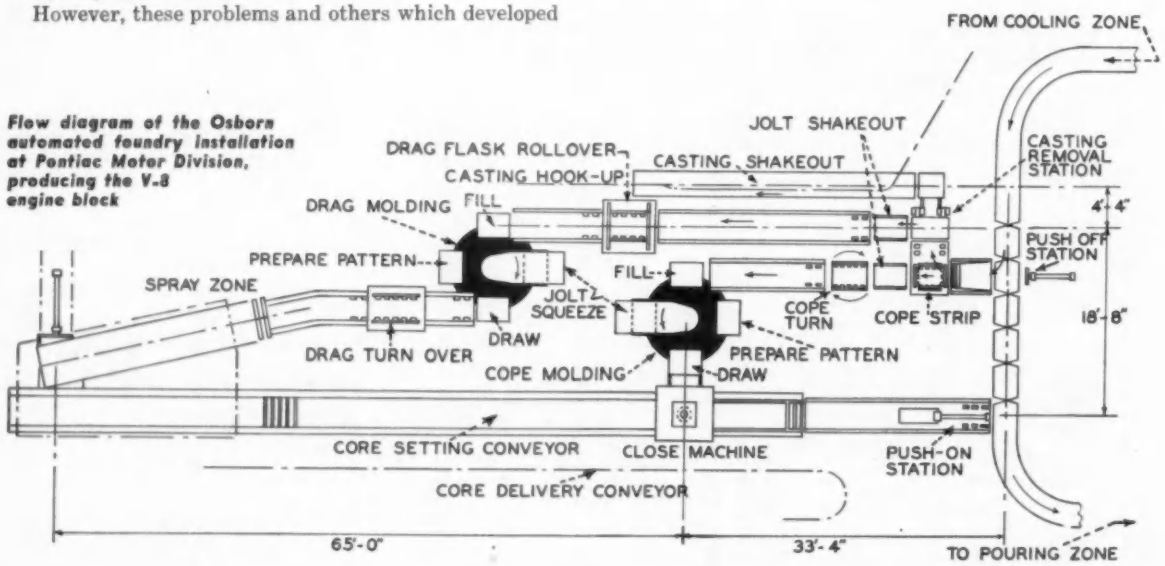
Automation in the foundry presents its own problems of handling and transfer equipment. It's one thing to transfer blocks weighing several hundred pounds—it appeared much more difficult to transfer flasks filled with molding sand and cylinder blocks weighing a ton or more.

However, these problems and others which developed have been overcome by Pontiac's foundry engineers in cooperation with the Osborn Manufacturing Co., of Cleveland, Ohio, and automation in Pontiac's foundry is now producing an average of 150 engine blocks an hour. This line produces 2400 V-8 engine block castings per day. The automatic production unit is capable of cycling over 200 molds per hour.

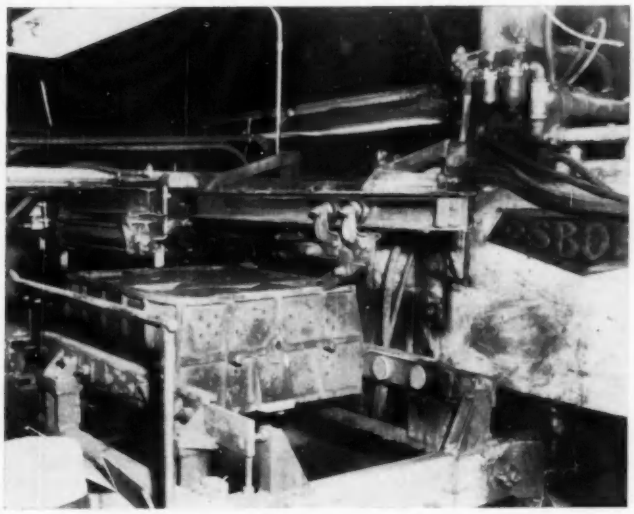
The equipment assumes the duties of molding, closing, and shaking out without the need of once manually handling the flasks. Only for setting chaplets and cores and pouring, drag spraying and hanging blocks on cooling conveyor is there need for workers other than watchmen to maintain a constant check of the control of the panel indicator lights and maintenance men to check and correct reasons for minor stoppages.

The unit performs the complete molding cycle from the time sand enters the molding machine to when the closed mold enters the pouring and cooling zone. Then, after cooling, the unit completes the cycle by stripping the cope from the drag and shaking out the sand and engine block castings and returning the empty flasks to the molding unit.

Operations in the unit are interlocked by electrical and pneumatic controls and the controls are designed so that they may be pre-set for required cycle time and production. The handling equipment is built in multiples of flask lengths. The movement of the flasks through the system occurs progressively through a distance representing approximately a flask length. Pusher cylinders are used in conjunction with conveyors to move the heavy flasks. A master control panel, manned at all times, is capable of controlling all phases of the automatic system.



Flow diagram of the Osborn automated foundry installation at Pontiac Motor Division, producing the V-8 engine block



A drag flask having been filled, jolted, squeezed, and drawn is being automatically moved to the roll-over station

There are two Osborn four-station molding machines, one for making copes and a similar one for making drags. They are identical in principle but require somewhat different set-ups and auxiliary equipment because the cope is deeper than the drag and the drag has to be rolled over to bring it face-up. Each machine has four stations and includes an indexing mechanism that carries the patterns and molds from station to station.

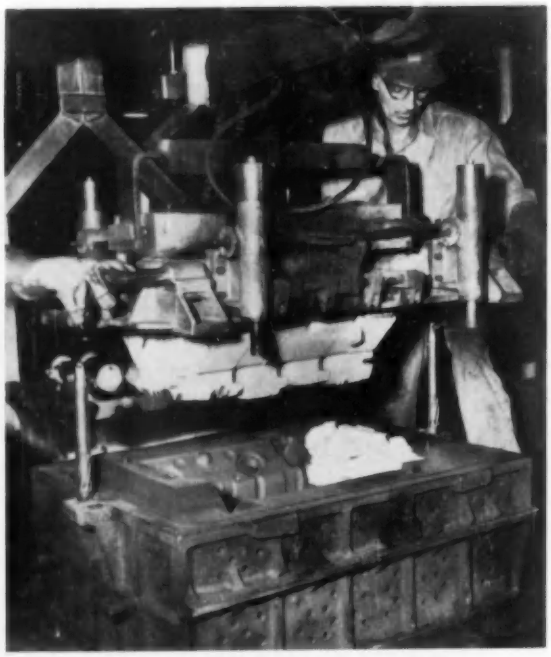
The operation begins at the drag molding machine. The metal pattern is blown off by an air jet and then sprayed with a parting lubricant at the make-ready station. While this proceeds, the conveyor moves the drag flask into the filling station. When indexing is complete, the pattern is automatically elevated. In moving upward inside the drag flask, the pattern picks up the flask and makes it ready for filling. Slight further upward motion results in opening the sand hopper gates and releasing the sand from the hopper which fills the flask with a predetermined amount of sand. The pattern with the flask still in place is lowered to the indexing mechanism which moves the pattern and flask to the third station where the jolt-squeeze action occurs.

Jolting and squeezing take place with the mold and floating pattern plates free of the indexing mechanism. After this operation is completed the flask is indexed to the draw station. In the meantime, another flask is being filled and another pattern prepared at the respective stations, as previously described.

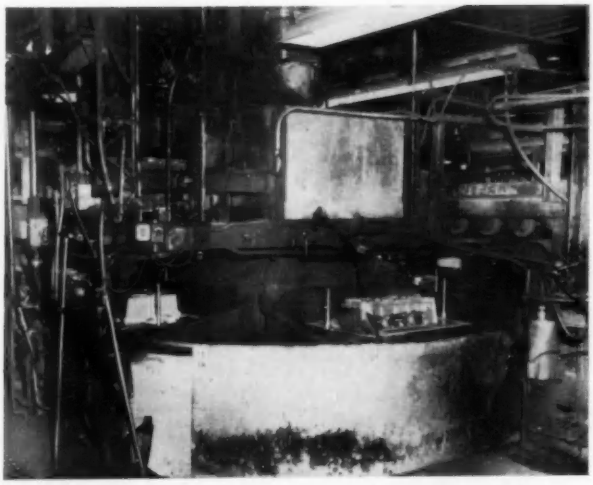
At the stripping station, the mold and pattern are raised. The mold is then drawn on rollers when the draw piston descends, returning the pattern to the rest position on the indexing cradle arms. The drag mold is then ejected onto a conveyor where it is moved to a turnover station. When fully inside the rollover,

TOP RIGHT—
The drag mold is rolled over automatically before proceeding into the spraying and skin drying area

LOWER RIGHT—
Pre-assembled cores are transferred by a core setting fixture which lifts the core assembly as a unit



The core setting fixture is brought manually into position over the drag mold. Guide pins assure accurate setting of the core assembly



The No. 4921 Osborn molding machine, a four-station indexing unit, fills the flask and jolts, squeezes, and draws the mold

Completed molds weighing about 2000 lb proceed on a moving roller conveyor to the mold conveyor for pouring

the drag is automatically turned through 180 deg, bringing the drag face-up, ready to be moved off onto a conveyor for the next operation, which is spraying the drag mold with a quick-drying graphite solution.

After spraying, the drag molds are pushed onto the coring conveyor. The seven cores which are to be set are pre-assembled and set into a fixture on a conveyor which carries them to the setting station. They are manually removed from the conveyor by means of a core-setting fixture which lifts the cores as a unit and positions them in the drag in a matter of a few seconds. This procedure results in quick and accurate setting, therefore, of the entire core assembly.

Meanwhile, the cope is being processed on a similar Osborn molding machine. The copes are made precisely the same way as the drags. At the fourth station, withdrawal of the pattern leaves the cope in an elevated position. The cope is moved out automatically into the closing machine and is positioned directly above the drag. The closing unit lowers the cope onto the drag and accurately closes the mold. The closed mold is then moved out of this position onto a conveyor which carries it to the pouring conveyor. Pouring is done on the conveyor in the pouring area. After pouring, the molds continue on the conveyors for the required cooling time, and then arrive at the jolt shakeout area. Castings are removed, flasks emptied, and the cope and drag halves are conveyed back to the two Osborn molding machines.

The handling equipment, though not a part of the molding machines, is integrated with them and synchronized in such a way that flasks approach and enter the machines at the proper intervals, and that mold halves are handled out of the machines when ready for such transfers. Indexing and transfers are effected pneumatically and hydraulically in response to solenoid valves that are for the most part actuated by the master timer.

Even the sand supply for this V-8 block line is handled automatically. Sand from the shakeout is checked by probes and the correct amount of water and bonding material is added automatically in the muller. After mulling, the sand is delivered on conveyors to the molding machine hopper.

A complete preventative maintenance program for this automatic foundry unit has been one of the principal reasons for its success. A four-man maintenance crew is available during each of the two shifts the unit operates. This crew consists of a pipefitter, electrician, millwright and repairman. During the third shift when the unit is closed down, a crew cleans, checks and repairs all key operations and machinery.

Edsel Uses Estimated 64.2 lb of Aluminum

EXCEEDING by a considerable margin the average of 38.1 lb of aluminum used in 1957 cars (see AI, Jan. 15, 1957), the estimated total weight of 64.214 lb of aluminum in the new Edsel is significant. It presages a record year in the automobile industry's usage of the light metal. According to Reynolds Metals Co., 1958 automobiles, trucks, and buses will use 400 million lb of aluminum with the per-car average running approximately 50 lb.

More than two-thirds of the total poundage of aluminum in the Edsel appears in functional components, while the remainder goes to interior and exterior trim. Representative aluminum parts among the 18 models of the four Edsel series include: front wheel brakes; transmission and control items; engine assembly; front door name plates; right and left outside quarter assembly panel; and twin battery-to-starter cables.

Listed below are data on Edsel aluminum requirements categorized by the CD 57B series. This model gives a representative picture from an overall standpoint of aluminum usage throughout the entire Edsel line.

EDSEL ALUMINUM REQUIREMENTS
(1958 CD 57B Series)

ENGINE

Part Name:	Weight, Lb
Cylinder Front Cover	3.260
Oil Pump Body	.900
Valve Rocker Arm Support	1.200
Oil Filter Adaptor	1.030
Pistons	17.000
Distributor Base	1.200
Carburetor Body	4.000
Carburetor Horn	.300
Plate Generator Brush	.490
Plate Starter Drive	.390
Plate Starter End	.390
Engine Sub Total	30.160

AUTOMATIC TRANSMISSION

Part Name:	Weight, Lb
Extension	7.200
Converter Stator	1.500
Stator Thrust Washer	.370
Output Shaft Sleeve	.200
Converter Valve Body	.200
Front Band Servo Body	.900
Front Band Servo Piston	.200
Front Band Piston Retainer	.200
Rear Band Servo Body	1.710
Rear Band Servo Piston	.430
Oil Pressure Regulator Cover	.500
Oil Pressure Regulator Body	.800
Rear Clutch Piston	1.000
Front Clutch Piston	.550
Lower Control Valve Body	1.500
Upper Control Valve Body	.700
Lower Control Valve Cover	.600
Control End Body	.230
Automatic Transmission Sub Total	18.790

BODY

Part Name:	Weight, Lb
Scuff Plate Front Door R. H.	.430
Scuff Plate Front Door L. H.	.430
Scuff Plate Rear Door R. H.	.298
Scuff Plate Rear Door L. H.	.298
Body Side Name "Edsel" (2 required)	.228
Grille Name "Edsel"	.114
Front Fender Name "Citation" (2 required)	.527
Push Button Trim Plate	.054
Body Serial Plate	.015
Motor Assembly—Transmission Shift Control	.640
Instrument Cluster and Dials	.133
Plate Instrument Panel Name "Citation"	.089
Insert—Front Seat Cushion Side Shield R. H.	.204
Insert—Front Seat Cushion Side Shield L. H.	.204
Radio Receiver (approximate not estimated)	.100
Condenser and Tube Assembly Air Conditioner	5.750
Evaporator Assembly—Air Conditioner	5.750
Body Sub Total	15.264
TOTAL ESTIMATED WEIGHT	64.214

• • •

Clark Equipment Expects Sales Will Hit $145 Million in '57

Clark Equipment Co. president George Spatta predicted his company's sales for 1957 would be approximately $145 million, with earnings about $8 million. His forecast, made recently in St. Louis, is considerably below his earlier prediction of sales of $155 million and earnings of $9 million. He cited a month-long strike at the Jackson, Mich., transmission plant as chief cause for the decrease.

Clark's sales of construction machinery were running about 10 per cent ahead of last year, he said, and the company's new line of giant construction equipment would account for at least a $10 million increase in sales in 1958.

Nankervis Will Be Subsidiary Of Peninsular Metal Products

The Geo. L. Nankervis Co. of Detroit will become a wholly owned subsidiary of Peninsular Metal Products Co., when Peninsular completes the purchase of outstanding Nankervis stock. Peninsular president S. W. Sorenson, Jr., said the transaction should be completed by Feb. 1.

Sales totalled $7 million last year for Nankervis, manufacturer of automotive and aircraft manufacturing equipment.

1958 Engines Offer Wide

Carburetor Designs and Combinations, as Well as Fuel Injection Systems, Provide Flexibility of Engine Performance Characteristics

ANALYSIS of significant features of V-8 engines, offered in passenger cars, has become increasingly difficult and is even more complicated for the 1958 season. Examination of the record shows a mixture of entirely new engines, as well as a few notable examples where displacement has remained unchanged. Generally speaking, horsepower and torque are increased sharply on most of the engines, thus indicating that most passenger car producers have not yet reached the end of high performance ratings.

This year will go down as the year of induction systems. This year finds engines equipped with two-barrel carburetors, four-barrel carburetors, six-barrel carburetors, eight-barrel carburetors, fuel injection systems, and fuel injection compounds with special racing camshafts as in the case of the Corvette. The availability of this variety of fuel handling systems has brought about an amazing flexixbility of engine performance characteristics for engines of the same displacement in the same family. As examination of engine data for the various makes will make clear, a number of passenger car producers offer from six to seven or eight engine packages, using only three or four basic engines.

Because of such compounding of engine specifications, the present analysis has been restricted arbitrarily to engine options having the maximum bhp/cu in. ratio. Thus where a given make has an engine which is fitted with two- and four-barrel carburetors, the tabulation will show only the one with a four-barrel carburetor. In the few instances where an engine is used only with a two-barrel carburetor, it has been listed. There are several reasons for this arbitrary choice by the author. One is the limitation of space: we list some 38 engines currently as it is. The other is the fact that since we are rating engines in a descending order of bhp/cu in. ratios the tabulation makes for a better and more favorable comparison of engine potential.

Besides being the year of induction systems, 1958 also ushers an era of big engines. Cylinder bores now reach up to four inches in diameter and displacement exceeds 400 cu in. on several engines. For example, Lincoln and Mercury have engines of 430 cu in. displacement; the Edsel has one of 410 cu in. displacement; while the Chrysler 392 cu in. engine is very close to the 400 cu in. figure. Moreover, top speeds for some engines—particularly those with fuel injection now are up in the vicinity of 5000 rpm. With such engine speeds it is hardly likely that many owners will drive fast enough to take advantage of top horsepower ratings.

It may be well at this point to talk about horsepower ratings. The trend to increasingly higher ratings has been criticized for some time. Why are ratings still higher? Actually, there is a good reason for this, and it is not because car producers are aiming at higher road speeds. The fact of the matter is that the engine is being called upon to supply an ever increasing number of power-consuming devices. First, there is the increased load due to dual headlamps as well as other electric and electronic devices for operating power seats, windows, tops, etc., etc. Correspondingly larger generators are employed and these constitute a heavier drain of engine power.

But that is only part of the story. Air conditioning installations are increasing. These require a special compressor. Starting this year, a goodly percentage of cars will be built with air ride. This requires installation of an air compressor. In addition, most cars have power steering and that requires a hydraulic pump. Besides this, most cars specify automatic transmissions and these have hydraulic pumps that are in the power-consuming circuit all the time. By the time all of the accessory load is accounted for, the net output of a given engine is reduced very considerably below its advertised rating.

As a matter of fact, if engine ratings were not upped performance from the standpoint of acceleration and safe passing ability would be impaired.

Referring to the tabulation, there are four engines that top the field in maximum horsepower rating: Lincoln and Mercury are rated at 400-bhp, with a 6-barrel carburetion package; the Chrysler 300C is 390-bhp with fuel injection and 380-bhp with two 4-barrel carburetors; and Lincoln is rated 375-bhp with a standard 4-barrel carburetor.

However, the arrangement of engines in the tabulation is based not upon maximum output but according to the ratio of bhp/cu in. As shown, the first five places in the tabulation are as follows: No. 1—Corvette with fuel injection and special camshaft; No. 2 and 3 to the Chrysler 300C; No. 4—Golden

Variety of Induction Systems

By Joseph Geschelin

Hawk with McCulloch supercharger; and No. 5—Lincoln and Mercury with 6-barrel carburetion.

This year all makes have improved the ratio of torque/cu in. displacement. The top four ratings are as follows: Edsel—1.158; Lincoln—1.139; Chrysler Division—354 cu in. engine—1.144 and the 392 cu in. engine—1.147. The other engines, however, are quite comparable within small percentage points.

From the standpoint of bore/stroke ratio, the trend unquestionably has been to shorter stroke and much larger bore. The only exceptions are the three engines which have not changed physically this year. The Dodge Royal — 0.97; Golden Hawk and President—0.98. All the rest are oversquare, the top ratios being—Mercury with 1.30; and Chevrolet with 1.29. This trend, coupled with suitable rear axle ratios accounts for lower engine speeds for a given road speed with a consequent reduction in noise and engine wear. In fact, in this respect, many cars approach the conditions that obtain with overdrive.

Compression ratio, with only a few exceptions touches 10 to 1 with maximum rating of 10.5 to 1 on a number of makes. Obviously, compression ratio must inch upwards in relatively small yearly increments to stay within the bounds of the octane ratings of fuels available at service stations.

While engines have become bigger and their ratings higher, it is significant that some voices have been raised on the subject of fuel economy. Perhaps the most important statement came from Oldsmobile. The Olds 88 has been deliberately groomed for fuel economy by the adoption of a two-barrel carburetor which restricts fuel flow at the top range of the power curve. This is one of the first instances where improved engine efficiency has been converted to fuel economy. Engine designers have a choice of one of two directions when improving engine efficiency; one way is to convert the gain to increased output; the other is to restrict output but take the gain in fuel economy. That's the path selected for the 1958 Olds 88.

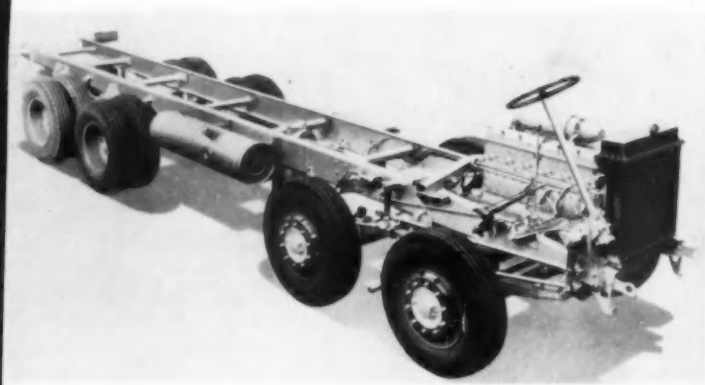
One of the significant developments this year is the appearance of a number of new engines with a fresh concept of combustion chamber configuration. In these

(*Turn to page* 122, *please*)

COMPARATIVE DATA
1958 OHV V-8 PASSENGER CAR ENGINES

	BHP (max)	Displacement (cu in.)	Ratio Bhp/cu in.	Torque (lb ft)	Compression Ratio	Bore/Stroke Ratio	Ratio Torque-cu in.
Chevrolet Corvette[3]	290	283	1.024	290	10.5	1.29	1.024
Chrysler 300C[2]	390	392	0.994	435	10	1.02	1.109
Chrysler 300C[4]	380	392	0.969	435	10	1.02	1.109
Golden Hawk[5]	275	289	0.951	333	7.8	0.98	1.152
Lincoln and Mercury[1]	400	430	0.930	480	10.5	1.16	1.116
Dodge D-500[2]	333	361	0.922	400	10	1.21	1.108
Cadillac Eldorado[1]	335	365	0.917	405	10.25	1.10	1.109
Plymouth Fury[4]	290	318	0.912	330	9.25	1.18	1.037
Plymouth[2]	315	350	0.900	370	10	1.20	1.057
Chevrolet[2]	250	283	0.883	305	9.5	1.29	1.077
Imperial New Yorker	345	392	0.880	450	10	1.02	1.147
Chrysler Saratoga	310	354	0.875	405	10	1.08	1.144
Lincoln and Continental	375	430	0.872	490	10.9	1.16	1.139
Plymouth[4]	305	350	0.871	370	10	1.20	1.057
Mercury	330	383	0.861	425	10.5	1.30	1.109
Rambler Rebel	215	250	0.860	260	8.7	1.07	1.040
Ambassador	270	327	0.856	360	9.7	1.23	1.100
Ford	300	352	0.852	395	10.2	1.14	1.122
Cadillac	310	365	0.849	405	10.25	1.10	1.109
De Soto Fireflite	305	361	0.844	400	10	1.21	1.108
Dodge D-500	305	361	0.844	400	10	1.21	1.108
DeSoto Firesweep	295	350	0.842	385	10	1.20	1.100
Dodge	295	350	0.842	385	10	1.20	1.100
Edsel	345	410	0.841	475	10.5	1.13	1.158
Oldsmobile[1]	312	371	0.840	415	10	1.03	1.118
Edsel	303	361	0.839	400	10.5	1.15	1.108
Pontiac[2]	310	370	0.838	400	10.5	1.14	1.081
Buick	300	364	0.824	400	10	1.21	1.099
Oldsmobile	305	371	0.822	405	10	1.03	1.091
Dodge Royal	265	325	0.815	355	9	0.97	1.092
Pontiac[1]	300	370	0.810	400	10.5	1.14	1.081
Chevrolet[1]	280	348	0.804	355	9.5	1.26	1.020
Dodge D-500[4]	320	361	0.803	400	10	1.21	1.108
Ford	265	332	0.798	360	9.5	1.21	1.083
Plymouth	250	318	0.785	340	9	1.18	1.069
President	225	289	0.779	305	8.3	0.98	1.055
Pontiac	285	370	0.770	395	10	1.14	1.067
Studebaker Commander	195	259	0.753	260	8.3	1.10	1.023

NOTES: [1]—Three, two-barrel (six-barrel) carburetor package.
[2]—Fuel injection system.
[3]—Fuel injection with special camshaft package.
[4]—Two, four-barrel carburetor package.
[5]—McCulloch Supercharger installation.



Eight-wheeled Albion Caledonian truck chassis has a load rating of 16½ tons and is powered by a 125-hp Leyland Diesel engine

Guy Formidable tractor features a light-alloy forward-control cab carried over the 135-hp Meadows Diesel

Latest British Vehicles Displayed

By David Scott

BRITAIN'S newest trucks and buses were displayed this year at the Scottish Motor Exhibition in Mid-November, which alternates with the biennial Commercial Motor Show in London. Staged in Glasgow's Kelvin Hall by Scottish agents and dealers, it revealed current trends in designs and engines.

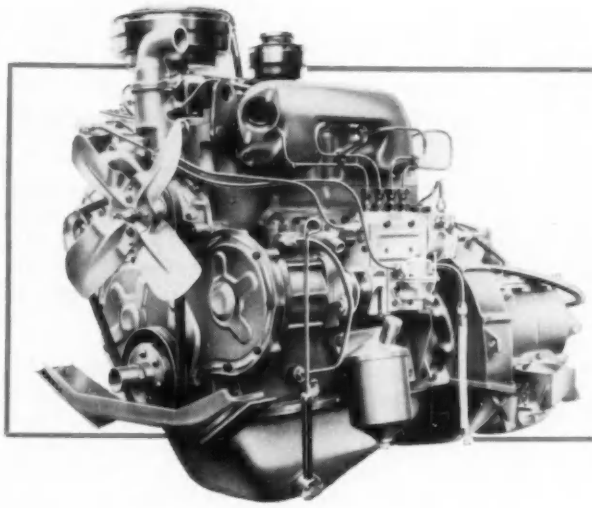
A greater number of light trucks and delivery vans are now designed expressly for the job instead of being converted from existing passenger cars. More Diesels are offered as an alternate to gasoline engines in vehicles of up to 1½ tons. And while Diesels are used almost exclusively in heavy British trucks, there is a move towards higher power, and more chassis manufacturers are making their own engines. In addition, automatic transmissions were presented on three makes of buses, and one coach incorporated Britain's first air suspension.

Albion, Scotland's only vehicle builder, unveiled its 8-wheeled Caledonian chassis which has a payload rating of 16½ tons with a gross weight of 24 tons. The channel-section frame is cross-braced with tubular and pressed-steel members, and has an overall length of 30 ft and a mean wheelbase of 17½ ft.

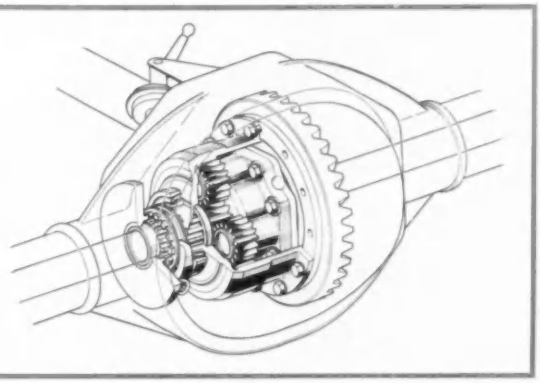
Brakes are air-hydraulic acting on the rear six wheels. The foot pedal controls a pneumatic actuator, supplied from the engine-driven compressor. This is linked to two hydraulic master cylinders in tandem, the larger one operating the brakes on the second and third axles, and the smaller on the fourth. The dual arrangement provides a certain amount of braking power in the event of hydraulic leakage in one circuit.

Engine, five-speed gearbox and cab are made by Leyland, with which Albion is commercially linked. The power unit is a six-cylinder, 598-cu in. Diesel develop-

Trojan Senior one-ton van and personnel carrier has independent front suspension using box-section trailing links and quarter-elliptic springs



Vauxhall (G.M.) four-cylinder Diesel of 200 cu in. displacement develops 64 hp at 2800 rpm



Vauxhall-built two-speed axle features hypoid gearing and pneumatic ratio shift and is offered on Bedford trucks from 4 to 10 tons

at Scottish Show

ing 125 hp at 1800 rpm. Optional extras include a third differential between the two driven axles, and power-assistance for the four-wheel steering, which is regarded as important for a vehicle of this type.

Another 8-wheeler on show was the latest version of the Thornycroft Trusty, which is offered with drive to one or both rear axles. Air brakes operate on all eight wheels, and Clayton Dewandre hydraulic power steering is standard equipment. The engine is a 600-cu in. six-cylinder Diesel rated at 130 hp at 2000 rpm. The transmission comprises a five-speed gearbox with an additional sixth ratio as overdrive if desired, and overhead-worm axles.

Guy displaced its new Formidable foward-control chassis as an 8½-ft-wheelbase tractor for an articulated trailer of 20 tons gross weight. Mounted over the front axle, the Meadows six-cylinder Diesel of 496-cu in. displacement puts out 135 hp at 2400 rpm. The gearbox by the same maker has five foward speeds including an overdrive top. This model has a light-alloy cab with plastic radiator grille and two-section wrap-around windshield. It is expected to be produced also as a 9-ton truck in wheelbases of 12, 14 and 17 ft.

Another Guy exhibit was the restyled Otter Mark III chassis rated at 7 tons. It has a foward-control cab with a detachable plastic grille concealing the pressurized radiator. Optional Diesel engines are a 57-hp Gardner and the 83-hp Perkins.

Vauxhall is one of the larger manufacturers in Britain to make an increasing number of components and assemblies itself instead of buying them from outside suppliers. At Kelvin Hall it displayed a new four-cylinder Diesel engine following the basic design of the six-cylinder unit described in A. I. of March 1, 1957. Intended to power the 1½- to 3-ton Bedford trucks, it has a displacement of 200 cu in. and a rating of 64 hp at 2800 rpm. Maximum torque is 143 lb ft at 1400 rpm. It replaces the Perkins P4 Diesel hitherto used in the medium-weight Bedfords, and costs the U. K. purchaser some $140 less.

A further Vauxhall innovation is a two-speed axle, now offered on trucks rated at 4 tons and over. This is the first time a vehicle builder in Britain has produced a double-reduction unit locally. Final drive of the

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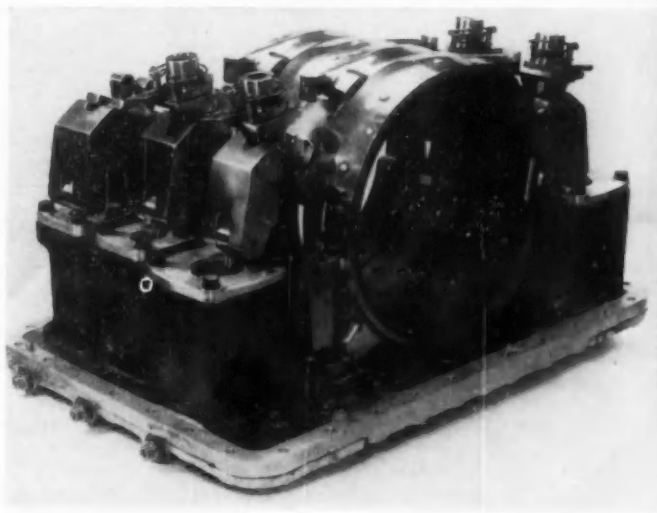
Brake band assembly for the Daimler automatic transmission has two rows of air cylinders cast integrally with the bottom cover



Air Powered Tools for Door Installations

at Ford's Kansas City Plant

TORQUE is considered a matter of prime importance in door hanging at Ford's Kansas City assembly plant because this is a major quality item. A fully-assembled convertible half-door weighs as much as 80 lb. Precise fit is necessary for safety, for smooth opening and closing, and for tight glass seal. It is evident that torque of door bolts must be kept within close tolerances to insure proper fit and trouble-free performance.

The door hanging is handled by the Size 5040T Ingersoll-Rand torque control Impactool. This air tool incorporates a torsion bar which can be twisted to the desired torque setting and which automatically shuts off the tool when it reaches the pre-set torque. Tools are set at the Ford plant by the tool repair man using a jig and checked on a hydraulic calibrator. The operator needs only to put the tool on the bolt, pull the trigger and hold it till the tool shuts off. There are 30 of the new Ingersoll-Rand automatic torque control tools used for hanging doors.

Ford specifies a torque of 18 to 24 lb ft and tries to stay near the upper limit of that range. The majority of the torque control tools are used in the passenger line body shop. First, the Impactool is used to run the six 5/16-18 tapered-end, spin lock head bolts that fasten the two hinges to the door. Another identical tool is used to assemble the door to the body with the same number and size of bolts.

Assembly of hardware and glass materially increases the weight of the door, and the installation work may throw off the precise hang of the door. Consequently, Ford has put some of the automatic torque control tools into the trim shop so that doors can be refitted accurately when the need arises.

After bodies are decked on chassis and cars move along to final inspection, the fit of the doors is checked once again. There are torque control Impactools here too for any necessary refitting of doors or correction of torque.

The same kind of air tools are used on the truck line but the procedure is somewhat different. The truck cabs reach the door installers with hinges already attached to the pillars. The door is then assembled to the hinges. If it is necessary to adjust the pillar bolts, the air tool is reversed to loosen the bolts and then runs clockwise again to bring the bolts to the prescribed torque. Six 5/16-24x1 bolts are required to attach the door to the hinges.

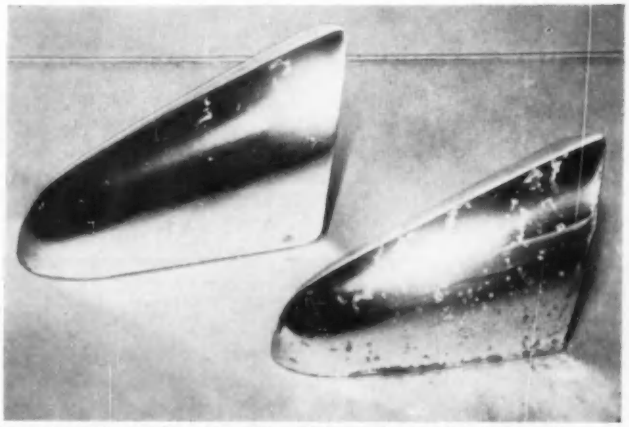
Above—Automatic torque control tool is used for refitting doors, when necessary, in trim shop

At right—Assembling door to body with Impactool

New Plating Methods Offer Improved Decorative Parts

BY H. MAHLSTEDT
Product Manager, Plating Products

Metal & Thermit Corp.



Two deposits of chromium after 72 hours in accelerated acetic acid salt spray. At left, bright crack-free chromium, 75 millionths of an inch, on 1 mil of nickel plus 0.5 mil of copper on steel. At right, ordinary chromium, 20 millionths, on same undercoatings.

IT is generally agreed that the automobile industry and the motoring public alike are somewhat dissatisfied with the decorative plating being done on today's cars made in the United States. The primary reason, of course, is the too rapid deterioration in the appearance of plated parts due to corrosion. The problem has been becoming progressively more acute and shows no signs at present of abating.

Deposits plated by ordinary methods, good enough a few years back, are inadequate today to withstand exposure to atmospheres containing increased amounts of industrial wastes and especially to the slush on roads contaminated with metal salts such as sodium and calcium chloride used to melt ice and snow. This slush is so corrosive that during the winter months, when there is expansion and contraction with changes in weather, it attacks the basis metal through the most minute pore or crack and makes the plated finish unsightly. These corrosive products occupy so much more space than the cracks and pores that the finish is permanently damaged.

Because most manufacturers share the dissatisfaction of their customers and recognize the need for improvement, increasing time and effort has recently been devoted to attempts to improve the quality of plated parts. These efforts have included the use of different basis metals for the parts, as well as a great deal of research in improved plating techniques by suppliers of electroplating materials and equipment.

At present, indications are that the solution to these problems may lie in some of the newer developments in electroplating rather than in the substitution of other basis metals for trim.

Two metals which have received much attention recently for trim parts are stainless steel and aluminum. Trim parts made of stainless steel are usually chromium-plated. On stainless steel, chromium plating is used to give and maintain the bright finish wanted to match the color of plated die castings, and to keep the stainless itself from tarnishing.

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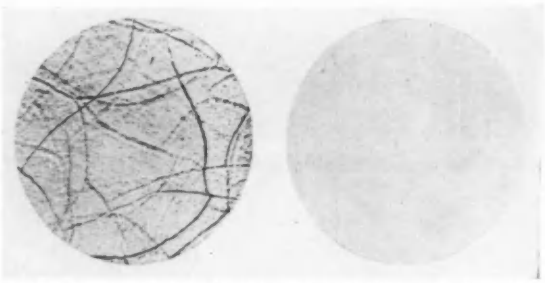
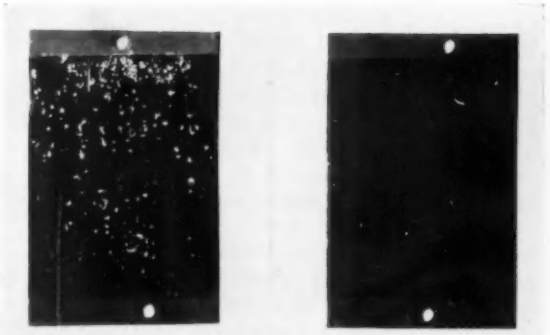
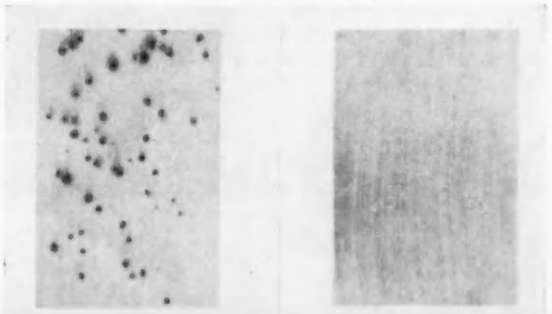


Photomicrographs of chromium plated deposits. Top, ordinary chromium develops cracks. Bottom, bright crack-free chromium deposit is continuous, does not crack.



Chromium plated steel panels with 1 mil copper 0.5 mil nickel after 48 hours accelerated acetic acid salt spray. Left ordinary chromium; right, bright crack-free chromium.

Below—Chromium plated steel panels with 1.3 mils nickel undercoat, after 20-hour Corrodkote test. Left, 20 millionths ordinary chromium. Right, 60 millionths bright crack-free chromium.



Growth of French Automobile Industry

Talbot sports model with 2.5 litre modified BMW engine

Buick Lido coupe with body by Pinin Farina; roof opens over front seats for easy entrance and exit

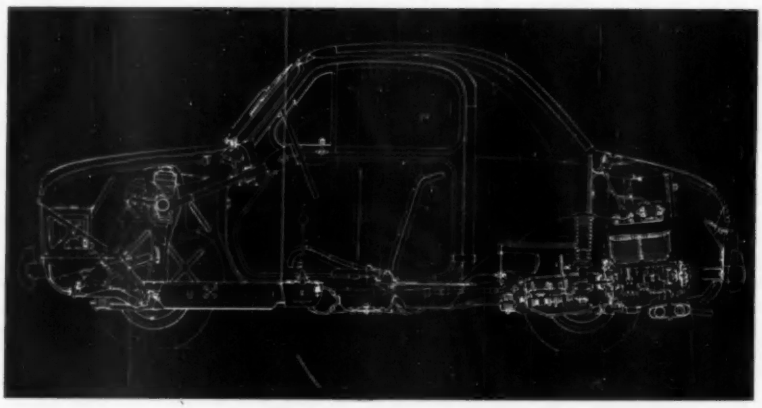
THE 1957 Paris Automobile Show, held during October, illustrated the French automobile industry's important part in France's economic life. Despite high fuel prices and a special annual tax of $250 for cars with engines of more than approximately 125 cu in. displacement, the industry is fairly prosperous. Automobile export figures are up by 40 per cent in 1957 as compared to 1956, although overall exports are up by only 11 per cent. Automobile production is running at 10 per cent more than in 1956, and over 25 per cent of the cars are being exported.

The high cost of fuel and the general economic situation have increased interest in small cars. A newcomer in this category is the Vespa 400 built by the Societe ACMA. This new car has a number of unusual features. The air-cooled, two-stroke, two-cylinder engine is mounted at the rear. Its bore and stroke are 2.48 in., displacement is 24 cu in. and output is 14 bhp at 4350 rpm. Compression ratio is 6.4 to 1, which permits the use of low octane fuel. Cylinders are inclined to the left at 30 deg and the engine is integral with the three-speed transmission. Overall dimensions of the car are: length 112.5 in., width 50 in., and height 49.25 in. With a wheelbase of 66.75 in. and a tread of 43.25 in., the Vespa is one of the smallest of Europe's minicars.

The largest standard French model, the Simca Vedette, is equipped with new bodies which feature wrap-around windshields. Its 143 cu in. V-8, L-head engine has been upped to 84 bhp at 4800 rpm and has a maximum torque of 112 lb ft at 2750 rpm. The Vedette line can be equipped with the Gravina automatic clutch as an optional extra.

A newcomer in the Renault line is a more powerful version of the small Dauphine. Modifications to the engine have raised the output from 30 to 37 bhp and the three-speed transmission has been re-

Part-cutaway view of the Vespa 400 showing location on the engine, steering gear, transmission, etc.



Reflected at Paris Show

By Robert Braunschweig

Peerless Gran Turismo coupe with Triumph TR 3 power plant

The Prince Skyline which is built in Japan

placed by a four-speed unit. The standard Dauphine sedan is available with the Ferlec automatic clutch.

Two French custom cars were on display, the Facel Vega coupe and the Excellence hardtop sedan. These two cars are equipped with Chrysler engines and transmissions.

The non-French exhibits included new Vauxhall Sixes, the Bristol 406, the Peerless from England, and the Prince Skyline from Japan.

The Vauxhall Six Velox and Cresta do not differ basically from their immediate predecessors, but have new bodies which are longer and lower than previous models. The Bristol 406 has a 135 cu in. engine—an increase of 15 cu in. from the previous model — and servo assisted Dunlop disc brakes on all four wheels. The 406 is not available in England, however, but is an export model only. The Peerless Gran Turismo coupe is a two-door, four-passenger sports prototype which is equipped with a Triumph TR 3 engine and transmission.

The Prince Skyline six-passenger sedan, built by the Fuji Precision Machinery Co. of Toyko, was said to be the first all-Japanese car shown in Europe. It features a De Dion rear suspension and is powered by a 90 cu in., 60 hp engine.

Among the special cars was a Lido coupe by Pinin Farina using a Buick engine, transmission, etc.

According to tradition, Paris was the first European show where next year's U. S. cars were introduced. These were Chrysler, Edsel, American Motors and Studebaker-Packard lines.

U. S. Research Spending Up In 1957, NSF Report Says

The Federal Government spent about $3 billion in the fiscal year 1957 for scientific research and development, an increase of almost 20 per cent over the $2.5 billion spent in 1956.

The latest figures on the Government's research and development budget are included in a report released by Alan T. Waterman, director of the National Research Foundation.

In 1957, the report states, the Defense Dept. and the Atomic Energy Commission received 85 per cent of total funds. More than 60 cents of every dollar was spent for development; less than 40 cents for research, both applied and basic. Basic research accounted for only 8 cents.

Of each Federal R&D dollar, the report continues, 35 cents went to profit organizations, 14 to educational institutions, 48 to Government agencies, and 3 to "other" institutions.

Curtice Awarded French Medal For Economic Contributions

General Motors president Harlow H. Curtice has been awarded France's highest economic tribute, Commander of the Order of National Economy, for contributions by him and General Motors to the "economy of France."

The Grand Cross of the Order was bestowed at Gennevilliers, France by Ivan Cabanne, Cabinet Director of the Secretary of State for Economic Affairs. In making the presentation, Mr. Cabanne said that France is "grateful to General Motors for the introduction of American methods."

SAE Holds Three Meetings

Here Is a Report on the Activities at the National Transportation, Diesel Engine, and Fuels and Lubricants Meetings Held Simultaneously in Cleveland

An unusually large attendance rewarded the efforts of the people who put together the program for the SAE National Transportation, Diesel Engine and Fuels and Lubricants meetings held last month in Cleveland.

The L. Ray Buckendale Award was presented to the team of R. M. Riblet and C. M. Kitson of the Timken Roller Bearing Co. The lecture by the authors covered the field of bearing applications for heavy duty axles. The paper was quite comprehensive, ranging from an analysis of rear axle configurations to details of bearing applications and the necessary mathematics and computations. It should serve as valuable textbook material for students and young engineers, while for the practitioner it provides a comprehensive coverage of the subject within a single set of covers.

This year the Horning Memorial Award was presented to John M. Campbell, Scientific Director, Research Staff, General Motors Corp. The subject of his lecture was "Looking Ahead in Fuels for Automotive Transportation." Outlining the tremendous advances in fuel quality and in engine design during the past 30 years, Campbell paid tribute to the petroleum industry for its cooperation with the automotive industries and for the amazing progress that has been recorded. Looking into the future —not as far forward as the days of nuclear power—Campbell visualized that a fuel of predominantly hydrocarbon composition will continue to be the most suitable for automotive power. Much still remains to be done in fitting engines and fuels together more effectively and within the boundaries of sound economics. From the standpoint of refiners, certain modifications of the hydrocarbon structure and boiling range may make it possible to use fuels more effectively.

Engine designers, on the other hand, will have to provide better control of mixture ratio, ignition timing, and other factors. Much still remains to be done by way of improving the thermal efficiency of the engine, according to Campbell.

A number of papers presented by various oil companies all related to ways and means of rating gasolines now that octane ratings are going off the old scale. The Sun Oil Co. team of E. F. Marshall and C. S. Gilbert, Jr., reported that modified Uniontown and Borderline procedures give satisfactory ratings of fuels up to 105 Research Octane number.

That the anti-knock performance of gasolines can be accurately predicted from the laboratory data was reported by the Ethyl Corp. team of specialists—H. A. Toulmin, I. A. Caputo and H. J. Sewell. Road antiknock performance at all speeds can be accurately predicted by using a combination of Research and Motor Octane numbers and the aromatic and olefinic content of the fuel.

W. E. Morris of du Pont advised that under some conditions the inclusion of the hydrocarbon type improves the accuracy of combinations of laboratory Research and Motor Octane numbers.

Other reports dealing with this general subject were presented by W. A. P. Meyer and R. G. Golthwait of Gulf Research & Development Co.; R. B. Fell and H. F. Hostetier of Standard Oil Co. of Ohio; and A. V. Mrstik and R. B. Payne of Sinclair.

An investigation of combustion phenomena in unmodified engines, conducted by a Ford Motor Co. team of Robison, Behrens, Mosher and Chandler has led to the following conclusions: That engine noise can no longer be considered adequate for identifying specific types of abnormal combustion; a research tool has been developed which provides qualitative analysis of combustion development in unmodified engines; investigation of knock rating problems has been facilitated by the development of instrumentation providing a means of separating knock from other combustion phenomena.

The potentialities of the air ride developed by the GMC Truck & Coach Div. were discussed by D. J. LaBelle. Typical of what may be accomplished is found in the case of a GMC heavy duty tractor. By designing for an air suspension the tractor can be made nearly 2000 lb lighter, fifth wheel height can be reduced by five inches, and it will have all the other advantages claimed for the air suspension.

The Diesel group was treated to a number of important papers. One of these was a report on the turbocharged Diesel engines that have been supplied by Cummins Engine Co. for some time. The paper, presented by N. M. Reiners and W. D. Schwab, summarizes the company's work including development of its own turbochargers. They conclude by saying that one of the greatest challenges lies in

(*Turn to page* 118, *please*)

MISSILES among important subjects at Aircraft Hydraulics Conference

MISSILES were accorded an important role in the discussion of hydraulic components at the 7th Annual Aircraft Hydraulics Conference, sponsored by Vickers, Inc., which was held in Detroit last month. As usual, the meeting attracted a select group of specialists representing domestic and foreign airframe manufacturers and airline operators, including also representatives from USAF and Navy's BuAer.

This time the program consisted of a large number of prepared technical papers as well as a discussion of current problems with the hydraulic systems.

Three of the papers were essentially handbooks on new developments. "Selection of Airborne Auxiliary Power Transmission Systems" is a brochure prepared to assist the missle and aircraft designer in the selection of the most suitable system. It takes into account that auxiliary power is available in electric, pneumatic and hydraulic systems and that a specific problem dictates the selection of the most suitable type of system.

"Hydraulic Transmission Line Optimization Study" is another manual of value to designers in the selection of line sizes, calculation of line weight, and estimation of system performance.

The third borchure in the group is one dealing with Vickers airborne constant-speed drive packages.

One of the major problems in hydraulics systems, particularly in high performance aircraft and missiles, is that of contamination control. This was discussed in detail by J. H. Boucher of Chance Vought Aircraft with particular reference to work on the Cutlass and Crusader for the Navy. Out of this study came the technique of filter patch inspection as a service procedure. The author reported that out of current experience it is noted that "boot strap" reservoirs are coming into wider use, the objective being to reduce the risk of air leaking into the fluid system during shutdown. An entirely new line of fluids, fittings and equipment is being developed. Along with the demand for higher temperatures go synthetic fluids, metal seals, lapped fit seals, coolers and the like, most of which increase contamination problems. For the future the author visualizes systems with welded tubing and manifolding meticulously cleaned and vibrated, then hermetically sealed with extra large reservoirs.

Part of the answer to freedom from contamination was given by Authur Billet of Vickers in describing the continuing research program on clean pumps for clean systems. The objective here is to produce pumps that are clean before they are installed in missiles or aircraft systems. It is essentially a quality control program, subjecting all production pumps of "clean" type to a complete schedule of testing to assure cleanness. Although various techniques are being studied, the most promising is the filter patch test described by Boucher. As a matter of fact, this procedure is being studied by airline operators as a criterion of incipient system failure for units now in service.

A description of the hydraulic system of the French Caravelle commercial airplane, which features fully powered flying controls, was given by Robert Blanchet of Sud Aviation Corp. He noted that the requirements of simplicity and standardization were satisfied by using fittings, valves, hoses, etc., made to American AN standards; the fluid is mineral oil to French Specification FHS 1, which is equivalent to MiL-O-5606; and the operating pressure in the main systems is between 2000 and 2500 psi.

The Caravelle hydraulic system is composed of four sections, each identified by color. The *green*, or primary normal system, has its own reservoir and two engine-driven pumps, one on each engine. It services the landing gear, nose wheel steering, wheel brakes, wingflaps, air brakes, passenger ramp, and one side of the flying control servodyne tandem actuators.

The *blue*, or secondary normal system, also has its own reservoir and two pumps. It services the second side of the servodynes and the artificial feel device. Both green and blue systems are continuously and simultaneously in operation.

The *yellow*-stand-by system has an electrically driven hydraulic pump, which draws fluid from either the green or blue reservoirs. It services, in emergency, either side of the servodynes and the artificial feel device.

The *red*, emergency system, has its own reservoir and has an electrically driven hydraulic pump for servicing the landing gear, wheel brakes, and wing flaps. A two-stage heavy duty pump, incorporated in the red system, serves as a stand-by in the event of electrical failure.

An independent hydraulic system actuates the windshield wipers. It consists of two electrically driven hydraulic pumps with individual reservoirs, two hydraulic motors, purging valves and wiper blades.

One of the sessions was devoted to some new developments at Vickers. One example is the line of oil-cooled motorpumps, the first production unit being built for the Lockheed Electra. This is a 12-hp oilcooled unit weighing 31¼ lb,

(*Turn to page* 128, *please*)

Setup for Handling Wide Sheet

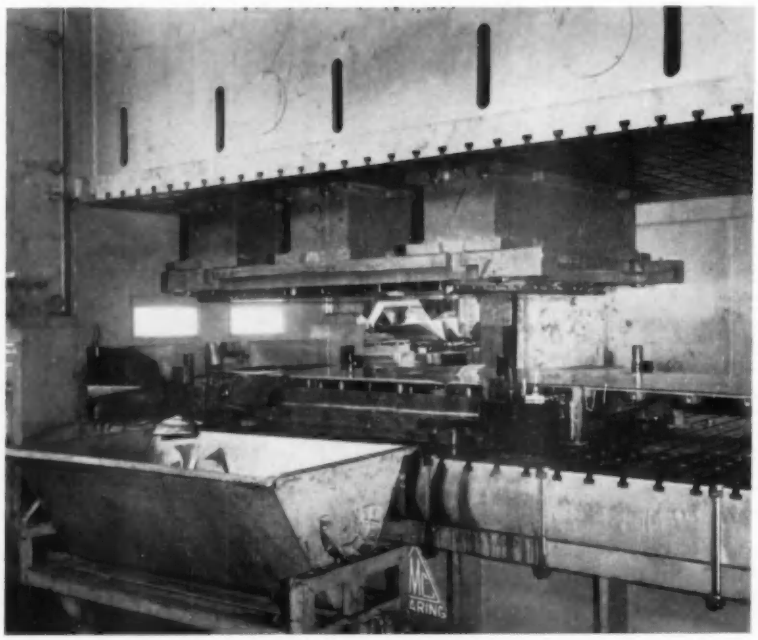


FIG. 1—Wide-bed Clearing press

NOTEWORTHY items of equipment, suitable for handling auto-body sheets up to 96 in. wide, are in operation at Buick Motor Div., Flint, Mich., on a compact line arranged for producing large blanks. At the time the illustrations were prepared this line was producing blanks for Buick front fenders.

The line consists of a large capacity, wide-bed Clearing press (Fig. 1), an advanced type of McKay coil reel (Fig. 2), a wide-bed McKay automatic washing machine (Fig. 3), and a McKay feed roll unit (Fig. 4).

The Clearing press, seen here with ram in up position, was being used at the time for making front fender blanks. Die equipment for this purpose utilized only a portion of the available bed width. Obviously, this press can be employed for much larger blanks if desired.

A unique feature of the McKay coil reel used here is found in the arrangement for

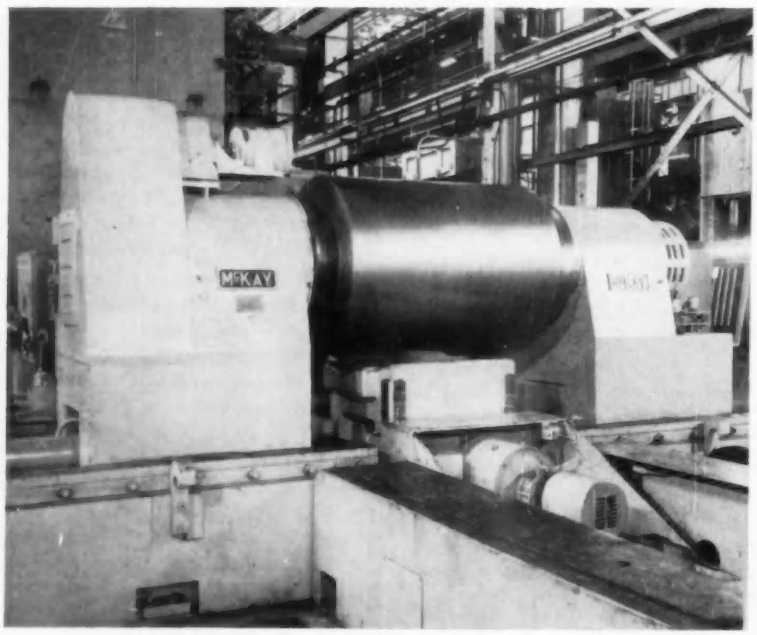


FIG. 2—Latest McKay coil reel

holding the heavy coils by means of conical-shaped arbors on both sides. Another feature is that the heads on both sides are movable by power drive on slides not only for receiving the coil but providing for any width of coil up to the maximum of around 96 in.

The McKay feed roll unit, too, is adjustable for width of sheet and is accurately calibrated for feeding sheet into the press in the desired measured lengths.

The automatic McKay wash-

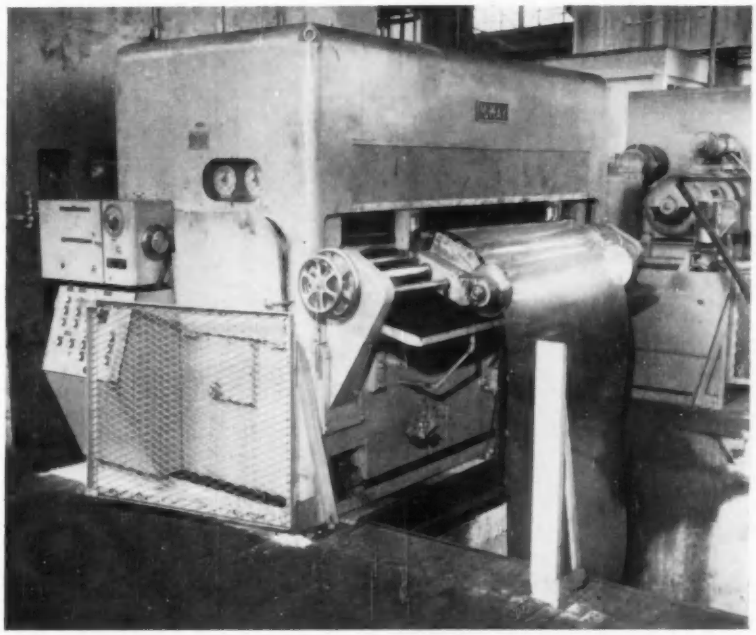


FIG. 3—Wide-bed McKay automatic washing machine

Metal at Buick Motor Division

ing machine takes sheet directly from the reel, straightens the sheet, gives it a chemical wash, and coats the sheet with a rust-preventive. The view of the washer, Fig. 4, also shows the provision for a suitable amount of slack in the sheet in the pit as it is fed to the feed rolls to compensate fully for the periodic cycling of the press.

This compact setup is said to be one of the first of its kind in an automotive press plant.

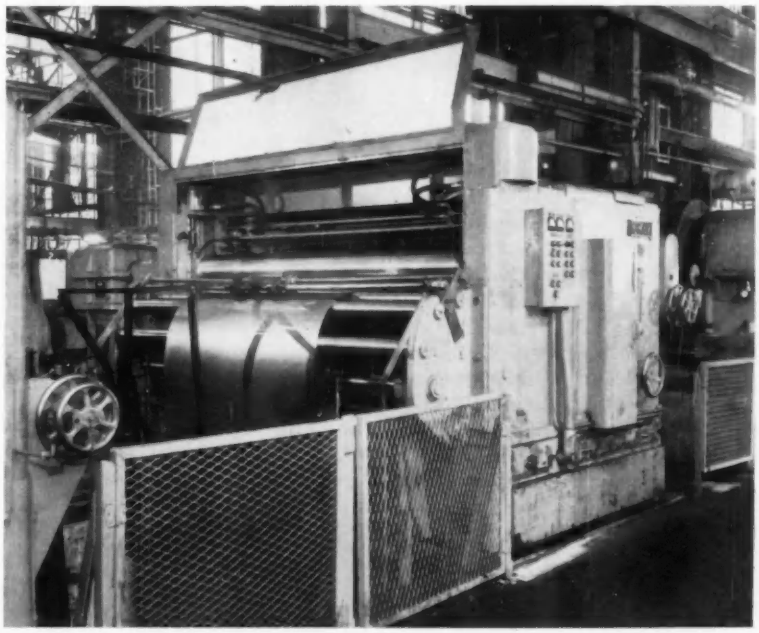


FIG. 4—McKay feed roll unit

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By Samuel Cummings

MASS SPECTROMETER

A new electronic instrument that can analyze chemical reactions such as take place in explosion of rocket fuels is being produced by the Cincinnati Div. of Bendix Aviation Corp.

The new device, called a Time-of-Flight Mass Spectrometer, can complete a chemical analysis in 0.0001 second. It operates on the principle of instantaneously indentifying vaporized gases, liquids and solids—including metals—by revealing their respective molecular masses.

The heart of the new instrument is a four-foot metal vacuum tube called an "ion gun." Ionized molecules of the elements being analyzed are pulsed like radar signals from one end of the tube to the other, and their speed, which is measured electronically, appears as a wave pattern, or spectrum on an oscilloscope.

"The instrument gives science a means of analyzing the many intermediate molecules produced in an instantaneous chemical reaction, such as an explosion," said Dr. Albert C. Hall, general manager of the Research laboratories division of Bendix, where the device was developed.

It is these intermediate molecules, some of them created and almost instananeously consumed in the combustion process, Dr. Hall explained, that foul up and eventually destroy an engine.

Smaller versions of the spectrometer could be installed in jet aircraft, according to Dr. Hall, to learn why engines sometimes "flame out" or stall when the plane flies into the exhaust of its own rockets. Other miniature spectrometers can be used in missiles and satellites to sample the "emptiness" of space and reveal its exact composition.

Other uses listed for the new device by L. E. Rasmussen, manager of the Cincinnati Div., will be in analyzing fuel combustion in turbo and ram-jet engines; for study of materials with very high temperature stability—including missile nose cones, ceramics, and glass; and as a workaday tool in industries where control of chemical processes is the key to production and new product development.

SEMICONDUCTORS—A BOOMING INDUSTRY

Semiconductors—tiny basic components of electronics—are replacing vacuum tubes many times larger. The semiconductor industry, no longer an infant, is running 25 per cent ahead of sales predictions made by its spokesmen a year ago, and industry prospects for 1958 are even brighter.

That's what executives of Hughes Aircraft Co.'s Semiconductor Div. told newsmen at a recent press conference in New York City. Joseph S. O'Flaherty, manager of the division, predicted that industry sales for 1957 would top $125 million as compared with forecasts of $100 million made last fall. He reported that his own company's semiconductor sales would exceed $20 million this year and $35 million in 1958, with the industry as a whole reaching $200 million next year.

Mr. O'Flaherty attributed the industry's rapid growth to its ability to translate the fruits of laboratory research into mass production of new and improved products more quickly than had been thought possible; new efficiencies, economies, and technical advancements in production; rapid discovery and proving of new applications; and substantial price reductions.

As examples of Hughes' price reduction, O'Flaherty cited a germanium diode used in computers that cost $5 four years ago and now sells for 70 cents; a silicon diode used in instrumentation, telemetering, and data processing that cost $6 two years ago and now sells for $1.25; and a silicon power rectifier with wide applications that cost $7 only 18 months ago and now sells for $3.

COMPUTER CENTER

A high-precision analog computer center that will sell time to companies that can't afford to buy their own computers will be opened in New York City early next year by Mid-Century Instrumatic Corp.

The new facility, called the Manhattan Computer Center, will be equipped with Mid-Century high-precision analog computers that can solve the most complex problems of astronautics, astrophysics, ballistics, chemical and atomic research, process design, and industrial manufacturing systems.

AUTOMATION AND LABOR

Automation is causing a nation-wide change in the structure of the labor force in American industry, according to a survey made recently by the National Industrial Conference Board.

The N. I. C. B. said that the survey covering 130 companies, disclosed that the proportion of workers engaged in direct production has declined in the last three years, but that these decreases were balanced by rises in non-factory employment, such as head office, clerical and sales personnel.

The board found that the addition of automated equipment in the production departments was the "most important single factor" in the change.

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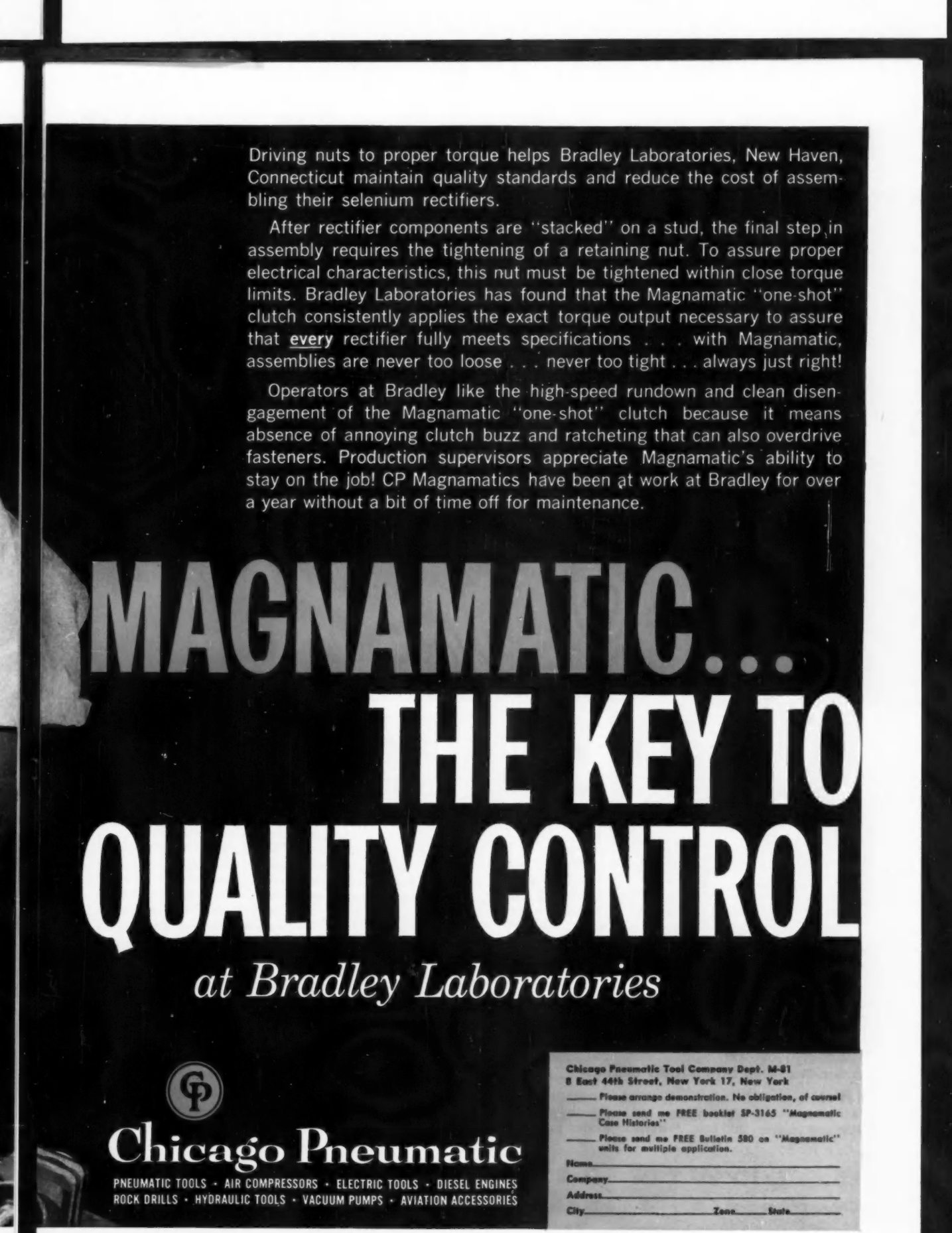

Driving nuts to proper torque helps Bradley Laboratories, New Haven, Connecticut maintain quality standards and reduce the cost of assembling their selenium rectifiers.

After rectifier components are "stacked" on a stud, the final step in assembly requires the tightening of a retaining nut. To assure proper electrical characteristics, this nut must be tightened within close torque limits. Bradley Laboratories has found that the Magnamatic "one-shot" clutch consistently applies the exact torque output necessary to assure that **every** rectifier fully meets specifications . . . with Magnamatic, assemblies are never too loose . . . never too tight . . . always just right!

Operators at Bradley like the high-speed rundown and clean disengagement of the Magnamatic "one-shot" clutch because it means absence of annoying clutch buzz and ratcheting that can also overdrive fasteners. Production supervisors appreciate Magnamatic's ability to stay on the job! CP Magnamatics have been at work at Bradley for over a year without a bit of time off for maintenance.

MAGNAMATIC... THE KEY TO QUALITY CONTROL

at Bradley Laboratories

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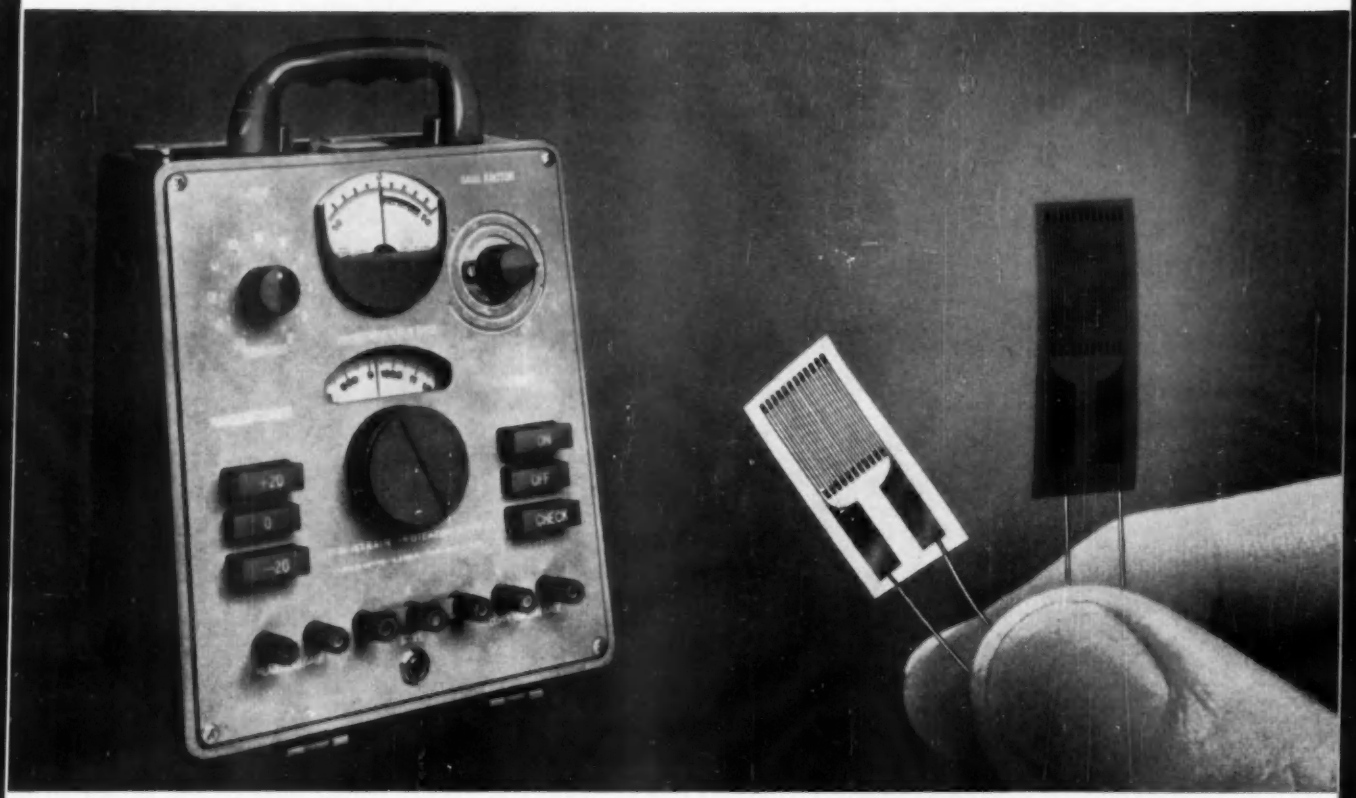
Newest strain-measuring equipment from Baldwin



Foil gages shown above are enlarged to twice their actual size.

NEW SR-4® strain indicator and NEW SR-4 bonded foil strain gages

Type N SR-4 Strain Indicator

This new, improved strain indicator features printed circuits and transistors, weighs one-third less than the previous model and has a smaller case. No warmup is required. In intermittent service its batteries last up to five times as long and cost two-thirds less. The legs of the case are positioned to permit tilting for improved readability. For direct readings with full external bridge, no calibration correction is required. Used as a preamplifier with standard cathode ray oscilloscope, it gives visual indication of dynamic strain with better response and in a broader range than the previous model. Frequencies up to 300 cps at amplitudes up to 3500 microinches per in. can be observed without appreciable distortion.

SR-4 Bonded Foil Strain Gages

Two new types of foil gage in ½ in. gage length, 120 ohms resistance, now make many types of stress analysis possible with new accuracy and ease. A Bakelite-bonded gage, Type FAB-2, and a quick-drying paper-and-cement-bonded gage, Type FAP-2, have marked advantages over comparable standard bonded wire strain gages. Hysteresis is now so low as to be negligible for stress analysis. Fatigue life of the paper gage matches that of comparable wire gages—that of the Bakelite gage is longer. Lateral strain sensitivity of both is down by one-half, offering new accuracy in measuring biaxial strains. The quick-drying paper gage is quick and easy to install. The Bakelite gage offers such attractive features as dependable service at 300°F or higher. It is thinner and more flexible than comparable bonded wire gages—requires no preforming for curved surfaces and is thus easier to apply. Its glass fiber filler makes it less sensitive to moisture effects.

Both new foil gages have tinned lead wires, well anchored and easy to connect. Both gages are now stock items for prompt delivery. For more information on this or other Baldwin stress analysis equipment, write to Electronics & Instrumentation Division of B-L-H, Waltham, Mass. Or we will have a representative call on you at your request.

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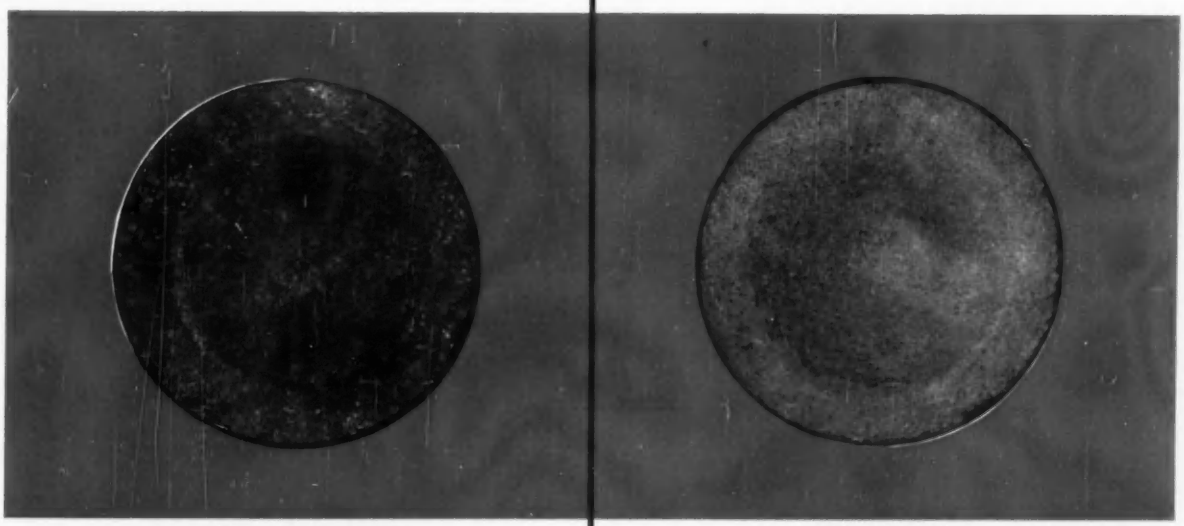
Waltham, Mass.

SR-4® strain gages • Transducers • Testing machines

The EATON Process of Aluminizing Exhaust Valve Heads PREVENTS PRE-IGNITION

CAUSED BY INCANDESCENT SCALE



NOT ALUMINIZED
Note Scale which Promotes Pre-ignition

ALUMINIZED
Absence of Harmful Scale Prevents Pre-ignition

Conventional exhaust valve steels, run at high temperatures, tend to corrode and scale, promoting damaging pre-ignition. This condition can be overcome by the use of expensive high-alloy materials. However, there is a simple and less expensive solution to the problem. By applying the Eaton aluminizing process to conventional exhaust valve steel, resistance to corrosion and scaling can be increased tremendously, thereby eliminating a condition which can be a major cause of pre-ignition.

Inlet valves conditioned by the Eaton aluminizing process also are contributing to the increased efficiency, dependability and service life of engines.

Our Valve Division engineers will be glad to discuss the application of Eaton aluminized valves to your engines. Send for illustrated literature.

Aluminizing of Inlet Valve Seat-Face Prevents Oxidation

After aluminizing by the Eaton process, this plain carbon steel valve was placed in an air atmosphere furnace at 2000°F. for 16 hours. Gross oxidation of the base steel resulted. The aluminized seat-face and margin areas were unaffected.

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News of the MACHINERY INDUSTRIES

Many Types of Controls, Machine Tool Drives, and Electric Motors Among Subjects at Ninth Annual Machine Tool Conference of the AIEE

By Charles A. Weinert

Electrical Engineers Hold Machine Tool Conference

Numerical positioning control was one of the principal subjects at the ninth annual machine tool conference of the American Institute of Electrical Engineers. Held in Milwaukee November 4-6, the electrification meeting was attended by 850 executives and engineers from the machine tool, electrical, electronic, and automotive industries.

On the three-day program were papers dealing with: Operating and maintenance experience with "stored intelligence" control installations; automatic positioning and gaging methods, including cost experience; developments in motors, such as synchronous induction, pancake, and spindle motors; electronic machine tool drives; and control elements, such as static and proximity limit switches.

Highlights

Proponents of electronic control systems, backed up by operating experience to date, are convinced as to their practicability and reliability. Users also seem to be satisfied, but realize the need for specialized training of maintenance personnel.

Numerical positioning control, while admitted to be complex in nature and relatively high in initial cost, has demonstrated substantial net cost savings. These result mostly from less time consumed in production preparation—and in actual processing. Its application appears to be best suited to low-to-medium-volume piece production.

Adapting existing machine tools to numerical control is possible, but most experts recommend building them new for the purpose. Many detailed provisions are entailed in suitably modifying machines for this mode of precise control, and costs for conversion are likely to be rather steep.

Punched tape, for providing input data to the control, is generally preferred. For one thing, it is cheaper when providing for related multiple sequential operations. It is also easy to prepare and handle. Choice of cards, tape or even manual control, however, depends upon the work being performed. All have their proper place in the picture. Manually set dials, making the machine semi-automatic, can be employed advantageously where parts are not repetitive and where time for advanced programming is not justified. Cards are most adaptable for positioning individual operations; and changes in one operation among a series can be made by the insertion of a new card in the stack. Punched tape is best suited to a program requiring a series of positioning motions in a particular related sequence, such as on lathes.

Reliability

Factors affecting the reliability of electronic machine controls were analyzed in a paper prepared by H. L. Palmer and presented by L. L Holmes, both of General Electric Co. These factors include electrical design, mechanical design, operating environment, maintenance practices, and components such as contactors, relays and electronic tubes.

Operating figures were cited showing that a large portion of downtime was chargeable to readjusting controls—indicating this phase should be given further attention by control equipment designers. The amount of time chargeable to component failures was considered to be sufficient to justify more care in their selection—and, in some instances, a "unified drive" to obtain better components. At the same time, it is felt that the machine tool maker and user need to work closer with the designer to fully acquaint him with environmental conditions—dirt, moisture and temperature.

Numerical Control

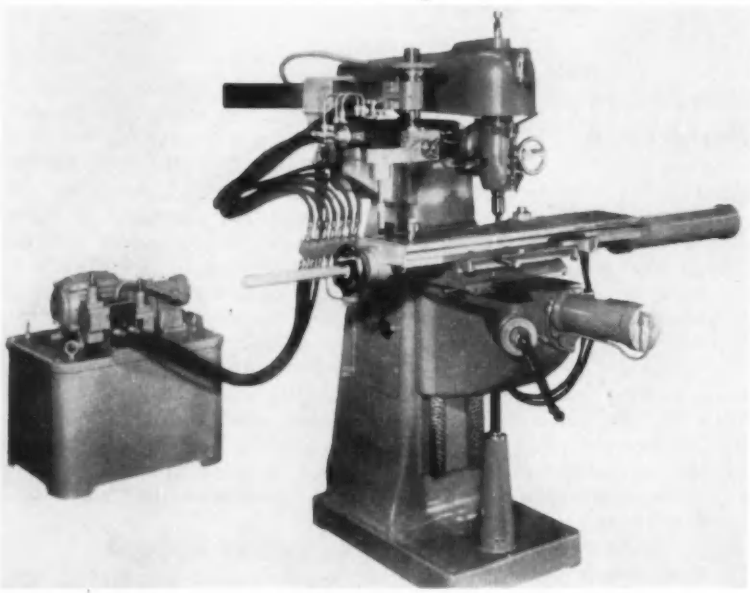
G. E. Kinney, Hughes Tool Co., was moderator of a panel discussion on "Machine Tool Path Control From Stored Intelligence," and members of the panel comprised representatives from the machine tool, control and aircraft industries. This session was in the nature of an open forum, with questions from the floor being answered by the panel members. The general tone of the session was that continuous tool path numerical control is working out extremely well in aircraft part production, and is making possible substantial reductions in costs for producing parts with complicated configurations.

"Point-to-Point Numerical Positioning Control" was the subject of a paper presented by S. C. Clark, Jr., General Electric Co. This type of control is applicable to a variety of machines which require positioning from one numerically defined point to another point. An example is in drilling a number of holes in a workpiece. Here the x and y coordinates of the hole loca-

(*Turn to page* 94, *please*)

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



U. S. Burke two-dimensional duplicating attachment for milling irregular contours

Two-Dimensional Table and Saddle Turchan Device

SUITED for following irregularly shaped contours, a new two-dimensional table and saddle turchan duplicating attachment is available for use with the U. S. vertical milling machine. The 20 by 10 in. attachment is complete with pencil type stylus. The operator holds the stylus in contact with the ferrous or nonferrous master and the device follows the prescribed movements in both horizontal planes at the pre-determined feed rate.

The longitudinal table feed screw is retained to facilitate set-up. An anti-backlash longitudinal table feed nut is provided. Optional accessories include a magnetic stylus and an automatic rise and fall knee attachment coordinated to the movement of the table and saddle hydraulic cylinders. Range and capacity of the basic machine is not limited by the attachment. *U. S. Burke Machine Tool Division.*

Circle 30 on postcard for more data

Metal Joining Process

INTERACT, a material developed for the chemical union of similar and dissimilar non-ferrous metals, is announced by Intertectics, Inc. It enables the chemical union of copper and aluminum. Also forms a permanent chemical bond through ion exchange between such materials as magnesium, titanium, brass, zinc, silver and gold.

The new material, under the influence of heat, eliminates surface oxide and causes similar metals to flow together at temperatures lower than the melting points of either of the metals being used.

Circle 31 on postcard for more data

Copper Plating Process

INTRODUCED by Metal & Thermit Corp., a new bright cyanide copper plating process uses a new combination of additives. One chemical determination and a single Hull Cell test are required to control the additives.

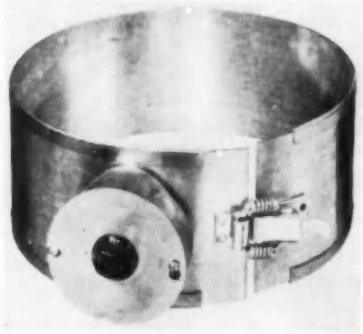
The solution is made with either sodium or potassium salts. Permissible cathode current densities range from 10 to 60 ASF. Neochel, a new bath additive is said to minimize anode corrosion and rough deposits. Two brighteners and a wetting agent comprise the other additives. The process is applicable to automatic, still and barrel plating.

Circle 32 on postcard for more data

Container Heater

DEVELOPMENT of a new Wrap-It-Heet PH-5 container heating element has been announced. It is for use on standard five gallon straight side steel pails or containers which are approximately 11¼ in. diam. The new device is used to heat or melt waxes, resins, adhesives, feed mixtures, oils and non-volatile chemicals which require heating to facilitate melting or removal from the container.

The watts density is said to be so low that it will not burn materials which have a slow heat acceptance



Acra heating element for containers

factor. Model PH-5, rated 1250-w at 115-v, is suitable for ac or dc operation. It is equipped with a three-heat switch and has a spring-loaded snap latch device to attach it to the container. *Acra Electric Corp.*

Circle 33 on postcard for more data

Radial Drilling Machines

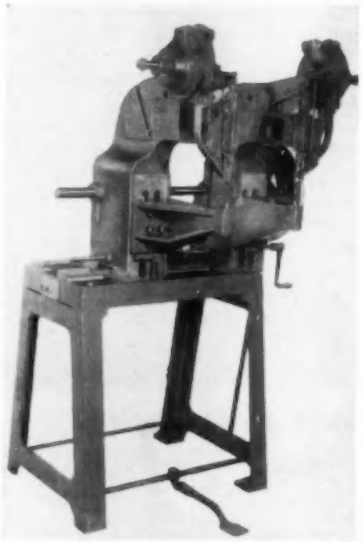
THREE optional head designs are offered with a new series of radial drilling machines now being manufactured. The head designs include: manual lever shift control, and partial and complete hydraulic pre-selection of speeds and power feeds. They are available with 13, 15, 17, and 19-in. diam columns; 4, 5, 6, 7 and 8-ft arm lengths; 36 spindle speeds up to 2300 rpm; and 18 power feeds from 0.004 to 0.125 in. with six positive geared tap leads. *Cincinnati Bickford Div., Giddings & Lewis Machine Tool Co.*

Circle 34 on postcard for more data

Double Drive Riveter

FOR feeding and setting two rivets up to 0.200 in. diam simultaneously, a new automatic double drive rivet machine has been designed. The machine has a 12 in. throat. Rivets may be of different head diameter and length specifications. Center distances adjust from ⅝ to 16 in. manually. Minimum center distance can be reduced to ¼ in. by a modification of the machine.

Designated Model 109, it can be furnished as a bench model when



Tubular Model 109 automatic riveter

equipped with a solenoid trip. It may also be supplied with air operation for fragile ceramic settings. The machine is applicable to riveting electrical chassis and equipment and automotive parts and accessories. *Tubular Rivet & Stud Co.*

Circle 35 on postcard for more data

Production Presses for Car, Bus, and Truck Frames

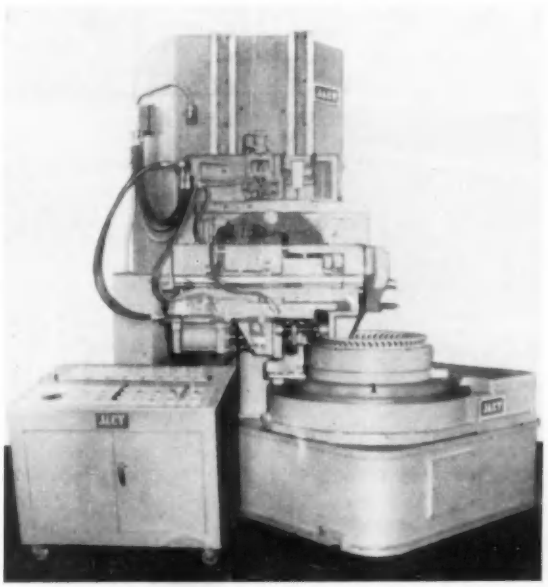
Blanking and perforating operations are performed on this 250 ton double-crank straight-side press. The device turns out blanks that become rear cross members which are incorporated with other assemblies into finished frames. The press operates at speeds up to 33 strokes per minute powered by constant-speed a-c motors. A 400 ton unit is also available for forming operations. (Baldwin-Lima-Hamilton Corp.)

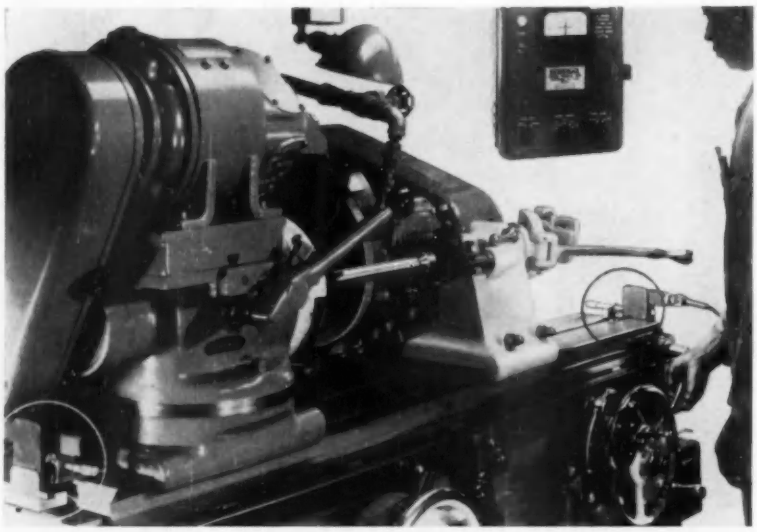
Circle 36 on postcard for more data

Precision Indexing and Piercing Machine

Recently unveiled is a new precision indexing and piercing machine available in tonnages up to 65 tons used to form angular rings from 16 to 54 in. in diam. The Jacy index table has resolution from 1 to 21,600 divisions of a circle. A mobile electric console contains manual and automatic push-button controls as well as means for immediate programming of any desired indice. The table is also available as a self-contained unit 18, 24, 36 and 45 in. diam. in electric or hydraulic drive. (Modern Engineering Service Co.)

Circle 37 on postcard for more data





Federal, Sure-Set positioning gage for locating universal grinder swivel tables

Work Positioner Gage for Grinder Swivel Tables

UNIVERSAL type grinding machine swivel tables can be positioned by use of a new work positioning gage called the Sure-Set. It can be used with any make universal grinder of good capability and on a swivel table of any length.

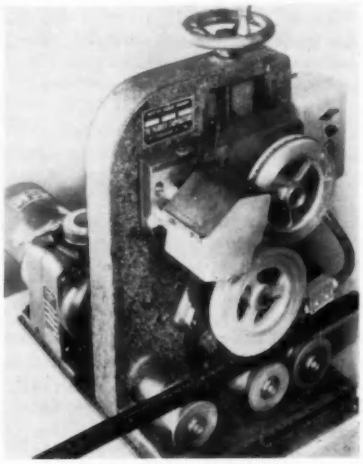
The device incorporates two completely closed electronic gage heads which locate on the grinder at the ends of the table and work into a special amplifier through a selector switch. Associated with the amplifier is computing circuitry which automatically corrects for the difference between work length and table length. *Federal Products Corp.*

Circle 38 on postcard for more data

Offset Marking Machine

DESIGNED to handle material from ⅛ to 4 in. OD, a new, small, offset wire bar and tube printer has a magnetic starter that activates the motor as the material passes through the open limit switch. This is said to eliminate excessive build-up of ink on the printing wheel and to assure clean, clear marking.

The printer is available with left or



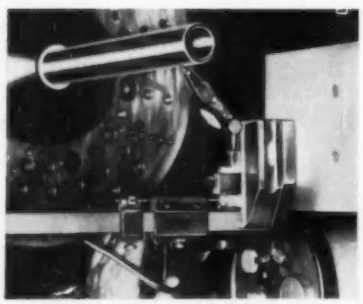
Pannier offset marking machine

right-hand feed and will fit into conveyor-line systems without disturbing present line movements. It will print a continuous message set on 24-in. offset printing wheel in type sizes from 1/16 to 1 in. A ½ hp-3 phase, variable speed motor chain drives, with a floating idler sprocket, only the marking head to forward the material through the unit with a light printing pressure. The unit is available as a friction-operated unit for use with continuous-flow-materials. *The Pannier Corp.*

Circle 40 on postcard for more data

Inspection Tool

CALLED the Cylinder Square, a new magnetic inspection tool developed to check squareness, run-out and concentricity of parts, shafts, spin-



AA Gage magnetic inspection tool

dles, bores and similar objects is now available.

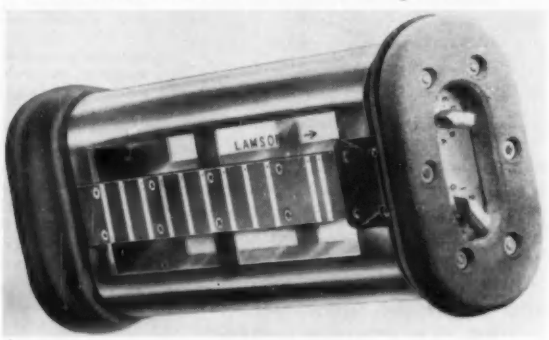
Powerful magnets located in the face of the square hold it to the surface of the part or object being inspected. It is made of steel and is hardened and ground. Two standard sizes are available: 3½ diam base by 6 in. long, and 7½ diam base by 14 in. long. The device checks a full 360 deg of squareness. *AA Gage Co.*

Circle 39 on postcard for more data

One Piece Automatic Switch Airtube System

This newly designed 4 by 7 automatic switch airtube system is now available. It consists of a one piece polished cast magnesium carrier with eight plexiglas windows. The inside dimensions of the body are 2 7/16 by 5⅝ by 14 in. A printed circuit under the dials makes up the electrical circuit. (Lamson Corp.)

Circle 41 on postcard for more data



Gearing Equipment

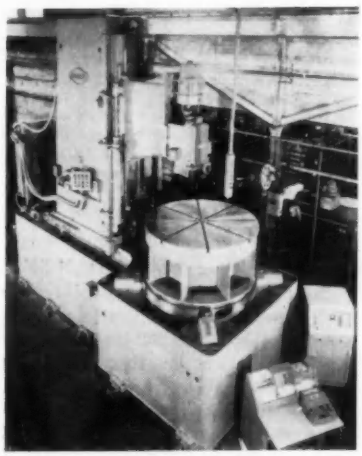
A LINE of helical-gear, speed-reducing apparatus called Moduline features a double-reduction cage with a fixed 5 to 1 set of low-speed gears. Spin-flame, heat-treated, high-speed change gears are mounted on rolled spline shafts so that they can be mounted or replaced with common hand tools.

A total of seven unit sizes are available with ratios of 5 to 1 to 625 to 1. Stock components are the building blocks for gear motors, separate speed reducers and package motor reducers. These components can be assembled into arrangements providing for floor, ceiling, wall or angle mounting. Basic subassemblies and accessories can be combined to make any helical-gear drive configuration. *Westinghouse Electric Corp.*

Circle 42 on postcard for more data

Bolt-Hole Drill Press

BUILT for a jet engine maker, a new vertical hydraulic-feed, single-spindle drill press with a horizontal index table drills holes on circle diam



Baker electronic drill press

from 0 to 60 in. Bolt circle spacing is variable and the control is manual or fully automatic.

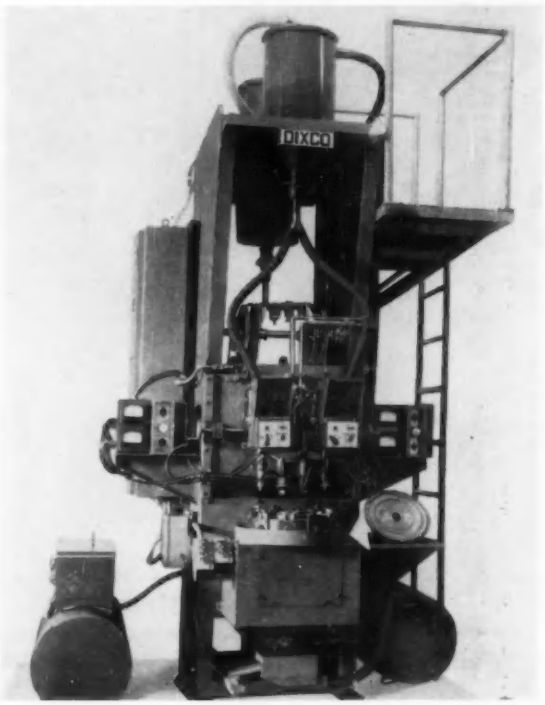
Total travel of the spindle is 30 in., cycle is rapid advance feed and rapid return. Spindle speed is variable between 60 and 3000 rpm. The spindle develops 2 hp at 60 rpm and approximately 3 hp at 3000 rpm. The index table is electronically controlled. Automatic operation of the index table is through a standard IBM punch card system. *Baker Brothers, Inc.*

Circle 43 on postcard for more data

Submerged-Arc Welder for Transmission Parts

Fully automatic except for loading and unloading, a new submerged-arc welder was developed for an operation in the manufacture of automatic transmission parts. This machine, designed to weld two different models of fly-wheel ring-gear assemblies, completes 10 equally spaced submerged-arc spot-welds in the first assembly 19 seconds after the run buttons are pushed. Flipping a selector switch on the control board will cause the machine to join the second assembly with 10 unequally spaced welds. The unit will process 100 per hour of either assembly at 80 per cent efficiency. The machine weighs 15,000 lb and it measures 6 by 6 by 13 ft. (Dix Engineering Co.)

Circle 44 on postcard for more data



Mobile Marking Unit

FOR hand-stamp operations that arise at various points in the plant, a new mobile marking system designated the Marking Cruiser has been designed. The unit contains all the items necessary for hand stamping.

Schmidt mobile marking unit

It also provides the working area. Two hammers, a retractable stool, a lamp and a shock absorber pad are included. The font case contains four sizes of hand stamps: 1/16, 3/32, 1/8 and 3/16 in., of 40 characters each. Size of the unit is 24 by 36 by 32 in. *Geo. T. Schmidt, Inc.*

Circle 45 on postcard for more data

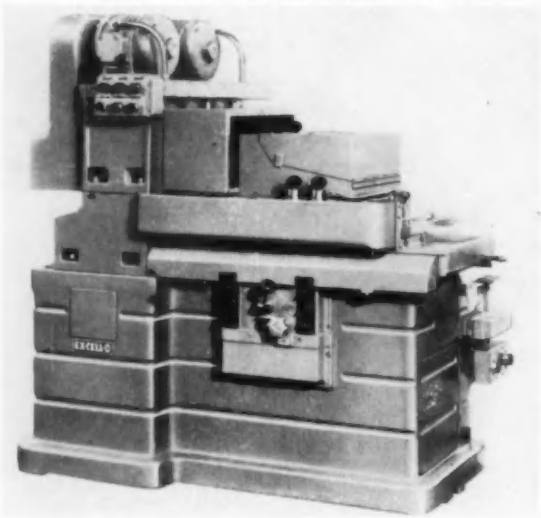
Valve Operator

VALVE operator SM-11-X mounts directly on the steam of rotary valves. Called Valvetrol, it provides remote control of the valve from a pushbutton station with meter indication of valve position, or proportional control in automatic systems with the control signal originating from a d-c, zero to five ma source, or from an a-c control signal.

The Valvetrol comes in totally enclosed housings. It provides proportional control for valves requiring from 1/6 to 40 turns and stem torques up to 800 lb-in. Full open to full close times can vary from 2 to 60 seconds or longer depending on requirements. *The Jordan Co., Inc.*

Circle 46 on postcard for more data

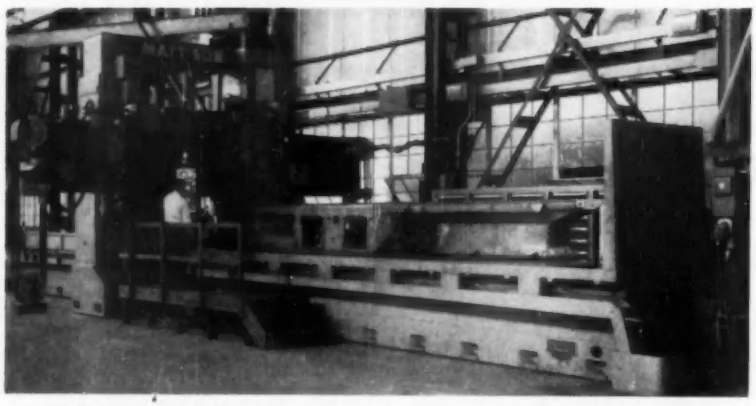
Bor-Drilling of Small Transmission Parts



Recently unveiled, style 112-D precision boring machines equipped for the bor-drill process are now available. Small transmission parts, transmission range selector shafts, are manually loaded and hydraulically clamped in a three-station fixture. Three bor-drill tools then advance and bore a 0.132 in. diam., 2½ in. long through hole in each of the three parts. The machine will not cycle until each part is securely clamped in its station. (Ex-Cell-O Corp.)

Circle 47 on postcard for more data

Dual-Spindle Surface Grinder Handles Large Parts



Mattison dual-spindle surface grinder with two work spindles is self lubricated

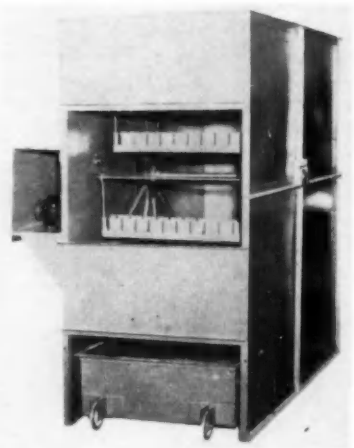
ANNOUNCEMENT has been made of a new dual-spindle surface grinder with two work spindles that is capable of grinding work up to 80 in. wide. There is a 60-in. clearance from the grinding wheels to the table top. Both heads are controlled from a single pendant. The table always starts in the forward direction.

Hydraulic and mechanical cross feed are provided. Hydraulic power provides both traversing and jump feed in increments from ½ to 4 in. When the job calls for grinding of shoulders, mechanical micrometer cross feed in increments of 0.001, 0.002 or 0.0002 can be set at the pendant control and actuated by push-button or by reversal of the cross slide or the table. Table feed ranges from 5 to 100 fpm and cross slide from 5 to 30 fpm.

Use of a built-in, direct drive motor on the vertical spindle permits fine finishes to be obtained. In addition, vertical head swivels up to 50 deg each way, permitting the machine to grind V and flat ways, dovetails, shoulders, edges, radii and contours all in a single setup. Both spindles have 30 hp motors and a 40 hp motor is provided for the table drive. A total of 20 motors is used on the machine to enable the operator to control all movements from a single station. Horizontal spindle takes up to a 22-in. diam by 6-in. face wheel and the vertical spindle takes up to a 20-in. diam segmental wheel. The machine weighs 250,000 lb. The base is 57 ft, 8 in. long and the table top is 60 in. wide by 24 ft. long. *Mattison Machine Works.*

Circle 48 on postcard for more data

Dipping Machine



Using only one operator, a new automatic brake shoe dipping machine designed by R. G. White Mfg. Corp. is capable of handling up to 700 shoes per hour. The machine, which holds 100 shoes, features an adjustable time cycle from 3 to 12 min and is an enclosed unit with an explosion proof exhtust blower. Overall dimensions are 84 by 78 by 51 in.

Circle 49 on postcard for more data

A-C Motors

SERIES "D" a-c motors in NEMA frame 364U through 445U come in foot-mounted and footless horizontal models in the 360 frame diam. They operate on 208 through 550 v in-plant a-c. Made in NEMA electrical design B, C, and D the large-frame motors may be specified in many speeds with Class A, Class B or high temperature Class H insulation. Part-winding starting is available.

Cast-iron construction, self-cleaning ribbed frame, corrosion-proof cast-iron fan, a shaft slinger to prevent the entry of foreign particles along the shaft, a watertight conduit box and hexhead bolts throughout are features of the motor. A neoprene gasket with enlarged pressure knobs indexes and holds motor leads for protection and identification as they enter the conduit box. *Reliance Electric and Engineering Co.*

Circle 50 on postcard for more data

Push-Pull Action Vise

THE patented Rapid Titan Nut, which is incorporated in a new drill press vise permits the engagement and disengagement of the vise screw automatically. The threads are brought into contact with the screw by rotating the vise handle in the tightening direction. The screw is released for free sliding action by turning the handle counter-clockwise.

The new vise is 4½-in. wide and can be turned on edge for 90-deg drilling. The sides of the vise are machined to form a true right angle with drill press tables. The vise is 2¾ in. high and has a 1¾-in. jaw depth. *Wilton Tool Mfg. Co., Inc.*

Circle 51 on postcard for more data

Special Lift Truck

DEVELOPMENT of a special lift truck for below-ground-level handling is announced by The Yale & Towne Mfg. Co. The truck has channels that lower below the ground level. It is applicable for handling in pits, lowering palletized materials into dipping or cleaning tanks or transferring material in a varied-floor-level plant.

The 6000-lb capacity model lift truck can handle loads 72 in. below the level of the floor, and raise them to a height of 41 in. above the ground level. Each channel has its own lifting cylinder and set of controls. The overall height of the unit is 83 in.

Circle 52 on postcard for more data

Steel Shelving

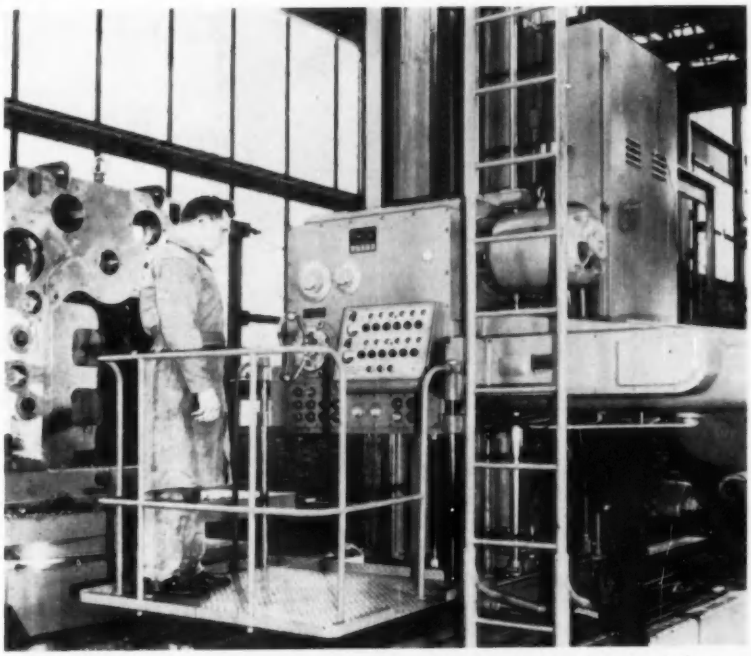
OFFERING a wide selection of shelving equipment for use in industrial plants, the Penco line includes plain shelving in 240 different size combinations. Also ledge shelving in 735 different sizes. The shelves, constructed of heavy gage steel, are finished in durable oven-baked enamel, electro-statically sprayed over a corrosion-resistant, zinc-iron-phosphate undercoat. Shelves are interchangeable and adjustable on one-in. centers. *Penco Metal Products Div., Alan Wood Steel Co.*

Circle 53 on postcard for more data

Constant-Level Oilers

CONSTANT level oilers, Style CR, cover a range of two oz to one gal in capacity. Features include a large internal passage for heavier oil, new filler top, remote mounting of oiler and the threaded air-intake can be equipped with filter, or air-intake can be piped into the top of the bearing housing to equalize the pressure and make the unit dustproof. Applications are ring-oiled and antifriction bearings, pillow blocks, gear boxes, pump housings and others. Lucite or glass reservoirs are available. All oilers are built with side and bottom outlet. *Oil-Rite Corp.*

Circle 54 on postcard for more data



Kaukauna automatic control system, mounted on a floor type horizontal boring, drilling and milling machine, features manual, punch-tape and dial controls

Three-Way Control System for Standard Machine Tools

THIS floor type horizontal boring, drilling and milling machine has a tool control system that permits operation through a standard manual control, a dial control of separate digital dimension information or through an eight-channel binary code-punched tape.

Basically, it is five-in. spindle horizontal boring, drilling and milling machine with 72 in. of vertical travel of the headstock on the column, and 120 in. of horizontal travel of the column on the runway. To this is added an automatic system of controls to permit semiautomatic operation.

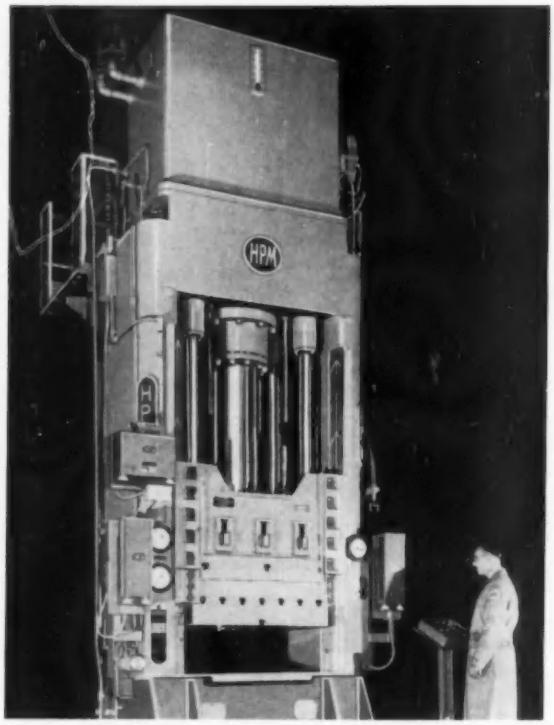
When operating with the standard manual electric controls, the positioning of the spindle, right or left, is controlled by a series of buttons on the headstock. When a button is fully depressed the machine traverses at 100 ipm. When half depressed it travels at the rate of four ipm. Identical pushbuttons control the movement of the column along the runway. Other buttons provide for clamping and unclamping of the head column base slide. Control dials provide for milling feeds and speeds. Actual shifting is accomplished by electro-hydraulic power. *Kaukauna Machine & Foundry Div. of Giddings & Lewis Machine Tool Co.*

Circle 55 on postcard for more data

Cutting-Tool Holder

A CARBOLOY tool holder features a one-piece chipbreaker-clamp that functions automatically, a clamp screw accessible from top or bottom, and a clamp color coding for identification. Clamp and chipbreaker are combined into one unit, which lifts or lowers automatically as the clamp screw is turned. Named Lift-O-Matic, they satisfy a wide range of operating conditions. Standard clamps come in chipbreaker widths for light, medium and heavy cuts. Toolholder shoulders are cut away to permit a smooth, unobstructed chip flow. *Metallurgical Products Dept., General Electric Co.*

Circle 56 on postcard for more data



Fastraverse, double-action hydraulic press is equipped with automatic shutoff device for added safety.

Double Action, Hydraulic, 200-Ton Press

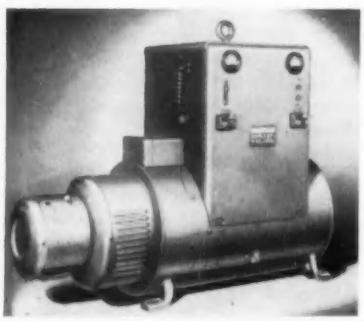
Now obtainable, a new 200-ton, double action press designated Fastraverse is equipped with an 18 in. curtain of light located across the front pressing area. When this curtain of light is interrupted, regardless of what phase of the cycle the press is in, a signal is sent to the press control circuit which de-energizes the electrical controls and automatically sets the hydraulic pump on the reverse stroke. This lifts the slide to the starting position at the top of its stroke and stops the press. The next cycle cannot be initiated until both forward buttons are depressed by the operator.

The working press area is 36 by 42 in. It has 56 in. daylight and the main slide stroke is 36 in. It is equipped with a 100-ton blankholder and a 50-ton die cushion. Closing speed is 720 ipm, and pressing speed 75 ipm which is adjustable down to 7½ ipm.

The control station is separate from the press and is equipped with a flexible cable so that it can be positioned where desired.

The press is powered by a 50 hp electric motor and one 50 gal radial piston, reversible type hydraulic pump. *The Hydraulic Press Mfg. Co.*

Circle 57 on postcard for more data



Carbonaire power source.

Cutting Tool Power

Addition of a new 1200 amp model to a line of machines designed as power sources for the carbon arc and compressed air method of cutting and gouging all kinds of metals has recently been made.

The new machine is rated at 1200 amp on 100 per cent duty cycle and has a maximum output of 1600 amps. The 900 amp model is recommended for carbon electrodes up to ½ in. in diam and the new 1200 amp model is recommended for carbon electrodes over ½ in. in diam. A single rheostat provides voltage control. This along with the self regulating features of the carbon electrode, provides control for all sizes of carbons used in carbon arc and compressed air cutting and gouging. Ammeter and voltmeter are optional equipment. *Hobart Bros. Co.*

Circle 58 on postcard for more data

Chain Driven Drill Head

Availability of a new multiple spindle drill head that transmits driving power to the drills from the head of a standard drill press with chains and sprockets has been announced. The ratio of spindle speeds can be changed by using sprockets of varying sizes. No idlers are required. Each unit is designed to specifications. The unit can be built to do more than one production drilling operation. Fixtures are designed and built with the drill head unit to provide a complete unit. The machine is made of cast aluminum. All parts such as bearings, chains, spindles, adapters and sprockets are standard stock parts at Nicholson-Berger Co., Inc., and self-lubricating bronze bearings are used throughout. All spindles are hardened and ground.

The eight spindle unit is light enough for one man to handle and was designed and built to drill 16 holes and counterbore 8 holes in a fly

NBC drill head.

wheel. The table indexes every 90 degrees and because drills of different sizes are used some spindles operate at faster speeds. Four spindles use step drills for the drill and counterboring operation. *Nicholson-Berger Co., Inc.*

Circle 59 on postcard for more data

Latest British Vehicles at Scottish Show

(*Continued from page* 63)

Vauxhall axle is by hypoid gears, with an epicyclic reduction train placer between the hypoid gear and four-pinion differential.

For a change of ratio the planet gear is locked or unlocked with a shifter sleeve moved by a vacuum actuator. This is positively operated through dual air lines by a valve with a remote push-pull knob on the conventional gear lever. Movement of the knob preselects the axle range, and the actual change occurs when the accelerator pedal is momentarily released. Two sets of ratio pairs are available, making the axle suitable for vehicles of up to 10 tons.

Independent front suspension is featured on the one-ton Trojan Senior van that made its debut at Glasgow. Unusual to commercial vehicles, the system comprises single box-section trailing arms hung by quarter-elliptic springs mounted below and parallel to the individual links. Each wheel is carried on a steering knuckle assembly, and steering is by a conventional drop arm, drag link and one-piece track rod. Telescopic shock absorbers are used. The Trojan also has a restyled alligator-type hood made of plastic. Engine is a 41-hp Perkins P3 Diesel.

Daimler is the most recent British entrant in the field of automatic transmission for buses. Its Daimatic consists of a fluid flywheel and Wilson-type epicyclic gearbox (see A. I. April 1, 1954), both of which the Daimler Company played a large part in developing. Gear selection is by the A.C.V. electro-pneumatic system (A. I. February 15, 1957).

The new aspect of the Daimler unit is the brake band and clutch assembly for the' three indirect ratios, direct top, and reverse gear. Brake bands and the 12-plate clutch (for direct drive, engaged by helical ball tracks that convert radial movement into axial thrust) are operated by five individual air cylinders cast integrally in the top face of the transmission bottom cover in two rows on either side of the running gear. First- and reverse-gear cylinders have 3-in. bores, and the others 2-in. bores. All have prefinished steel liners.

Compressed air at 80 psi to the reverse and intermediate gear cylinders is metered by small cylindrical valves positioned in the port in the base cover plate of each bore. The arrangement of these valves effects an overlap between the release of one gear band and the tensioning of another, so as to sustain torque and avoid jerking during changes.

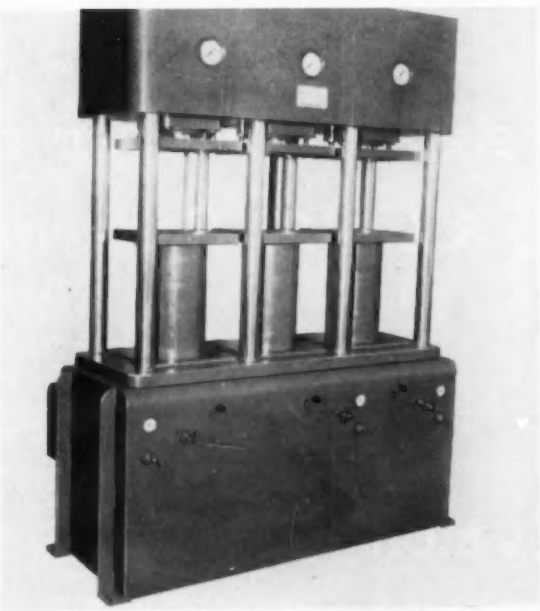
Each of these three gear trains is braked by a pair of opposed bands on a common contracting collar to give a double wrap around the drum. One inner lining band is rivetted to the outside collar along only half of its arc, leaving the other half free to slide. The second band is located merely by an integral lug in the center of its arc that protrudes through a slot in the outer collar and is attached by a link to the bottom cover.

Leyland exhibited a fully-automatic version of its Pneumo-Cyclic transmission based on Wilson patents. Drive to the four-speed air-shift gearbox is through a fluid coupling. This unit was fitted to a 72-passenger double-deck bus destined for use in Edinburgh. An A.C.V. Monocontrol automatic transmission was displayed in an A.E.C. double-deck bus made by the same firm.

A.C.V. also demonstrated what is claimed to be the first British application of air suspension to a commercial vehicle. Understood to be similar to the Dunlop Pneuride (described in A. I. of October 1, 1957), it was installed on the Brear wheels of a Bridgemaster double-decker in place of the usual coil springs.

The only new passenger car seen at the Scottish show was the small Riley One-Point-Five. It is powered by the British Motor Corp.'s B-type four-cylinder engine of 90.8 cu in. that develops 68 hp at 5400 rpm when fitted with twin S.U. carburetors and an 8.3 to 1 compression ratio head. The four-passenger body bears a strong family resemblance to the Wolseley 1500 introduced last spring, which in turn shares many components such as the torsion bar front suspension with the Morris Minor.

Rubber, Plastic Molding Hydraulic Press



Multiple presses designed to mold rubber, plastic or ceramic have been announced. These presses are single, double, triple or quadruple. Each section has a capacity of 50 tons. Platens are 13 by 13 in. and maximum pressure for each is 5000 psi. Temperature range is 150 to 550 F. Ramstrokes and daylight openings are 13 in. There are no pumps nor motors to add. The multiple stations provide for staggered curing cycles and various modifications are offered such as pressures up to 250 tons, several sizes of ram diameter water cooled platens and higher temperature ranges. (Allied Engineering and Production Corp.)

Circle 62 on postcard for more data

MACHINING PERFECTION always starts with the right steel

Pick exactly the right steel for any job from J & L's complete cold finished line

"Increased valve cap production 31% with J & L 1113 Bessemer steel"

This valve cap for drums requires considerable surface machining, drilling and tapping. Comparison test with the previously used open hearth leaded steel shows J&L "1113" leaded Bessemer steel upped production 31% . . . permitted change from a 15-second to a 10⅓-second cycle. Surface finish is smoother. J&L leaded steels assure you higher cutting speeds, longer tool life. Get facts from your distributor or write to Jones & Laughlin, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

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Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

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FREE LITERATURE

Conveying Systems 1

Publication of a new bulletin describing a series of apron conveying systems including a hinged steel type for automatic removal of chips, turnings and other scrap from high-production machinery has been announced. *The Alvey-Ferguson Co.*

Screw Machine Products 2

Depicted in a new four-page brochure are typical screw machine products. Fabrication operations and techniques required for each of the eight items shown as well as dimensions and tolerances are included. *Allmetal Screw Products Co., Inc.*

Fractional HP Motors 3

Announcement of the release of a new bulletin describing a standard stock fractional gear reducer motor, Model SG-15, has been made. A series of 16 motors is available ranging in output speeds from one rpm at 15 lb full load torque to 300 rpm at 1.2 lb full load torque. *Merkle-Korff Gear Co.*

Sling Chains 4

Contained in Bulletin DH-101 is a discussion on the properties of a line of sling chains. The four-page folder features a chart which gives the working load limits of 2-leg chains made of X-Weld 125 or Endweldur 125 chain, based on 50 per cent proof tests. *American Chain & Cable Co., Inc.*

Casting Facility 5

Shown in Catalog 57, 22 pages, are the physical properties and conforming specifications for magnesium and aluminum alloys. Listings include alloys for sand castings, permanent mold and rare earth alloys. *The Wellman Bronze and Aluminum Co.*

Piston Rings 6

Permaseal piston rings are described along with their specifications and applications in a six-page folder now available. Ring dimensions, tolerances, nominal wall thicknesses, assembly information and recommendations as to number of rings at specified psi are some of the topics covered. *Grover Piston Ring Co.*

Connectors 7

Specifications, diagrams and general information on new Continental Connector printed circuit connectors with right angle pins and polarizing screwlocks are contained in a two-page bulletin prepared by *DeJur-Amsco Corp.*

Castings 8

Contained in a four page folder is a description of B-Mold precision ferrous and non-ferrous castings. Typical applications and listings of metals suitable for each casting method are included. *B-Mold Div., Buckeye Brass & Mfg. Co.*

(Please turn page)

VOID After Feb. 1, 1958 **12/1/57**

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

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Mechanical Gap Press 9

Facts on a line of open back inclinable mechanical gap presses are contained in Bulletin M-100, four pages. Features and details for the 75, 100, 150 and 200-ton units are included. *A. B. Farquhar Div., The Oliver Corp.*

Corrosion Preventives 10

Corrosion preventives for industrial and military use are described in a chart which includes physical properties, application, removal, coverage and usage. Published by the *Pennsylvania Refining Co.*

Silicone Rubber 11

Properties of 50, 60 and 70 durometer silicone rubber sheets and fabric reinforced silicone rubber sheets for —85 to 500 F applications are detailed in a four page folder. *The Connecticut Hard Rubber Co.*

Die-Casting Process 12

"Intercast," die-casting process is explained in a four-page folder. This process permits automatic reproduction of small hinged or linked parts in die-casting without subsequent assembly. *Gries Reproducer Corp.*

Shaft Couplings 13

Form 99, four pages, describes semi-floating shaft couplings for use where units are spaced apart and one bearing only is provided for one of the units, such as engine driven generators. *Thomas Flexible Coupling Co.*

USE THIS POSTCARD

Welded Steel Rings 14

Welded steel rings are the subject of an eight page bulletin. Basic phases of their manufacture including bending, electronically-controlled welding, sizing, heat treating and X-ray inspection are discussed. *Edgewater Steel Co.*

Seam Welding 15

Bulletin SP-7A, 16 pages, contains information on seamless welding low-carbon and stainless steels. Details on welding techniques and production speeds, use of interrupted current and continuous current on low-carbon steel, welding dissimilar thicknesses of low-carbon steel and mash seam welding techniques are included. *The Taylor-Winfield Corp.*

Industrial O-Rings 16

Bulletin OR-57, seven pages, describes a full range of industrial O-Rings and gives information on sizes and compounds. *Chicago Rawhide Mfg. Co.*

Air Compressors 17

Various types of air compressors such as tank or base mounted, simple compressors and single and two stage units are listed in a four page catalog. Rated at ¼ to 50 hp, the aircooled compressors are electric or gasoline driven. *Curtis Mfg. Co.*

Electric Drills 18

Folder JE-2263 features a new series of reversible heavy-duty electric drills. Specifications of the "EN" series of ⅝, ¾, ⅞ and 1-in. drills are detailed. *Thor Power Tool Co.*

Numerical Control 19

Numerical control of production parts in automated production-assembly lines through the use of an automatic marking machine is described in two-page Bulletin SM 57 just released by *New Method Steel Stamps, Inc.*

Laminating 20

Featured in a four-page folder are new developments in laminating. Triple lamination, and aluminized butyrate thermoforming "sandwiches" with sealed-in color are among the topics discussed. *Lamart Corp.*

Single Action Presses 21

Bulletin 6.17, 16 pages, describes the function and illustrates specific applications, giving general press specifications, of four column single-action hydraulic presses. *Lake Erie Machinery Corp.*

VOID After Feb. 1, 1958 **12/1/57**

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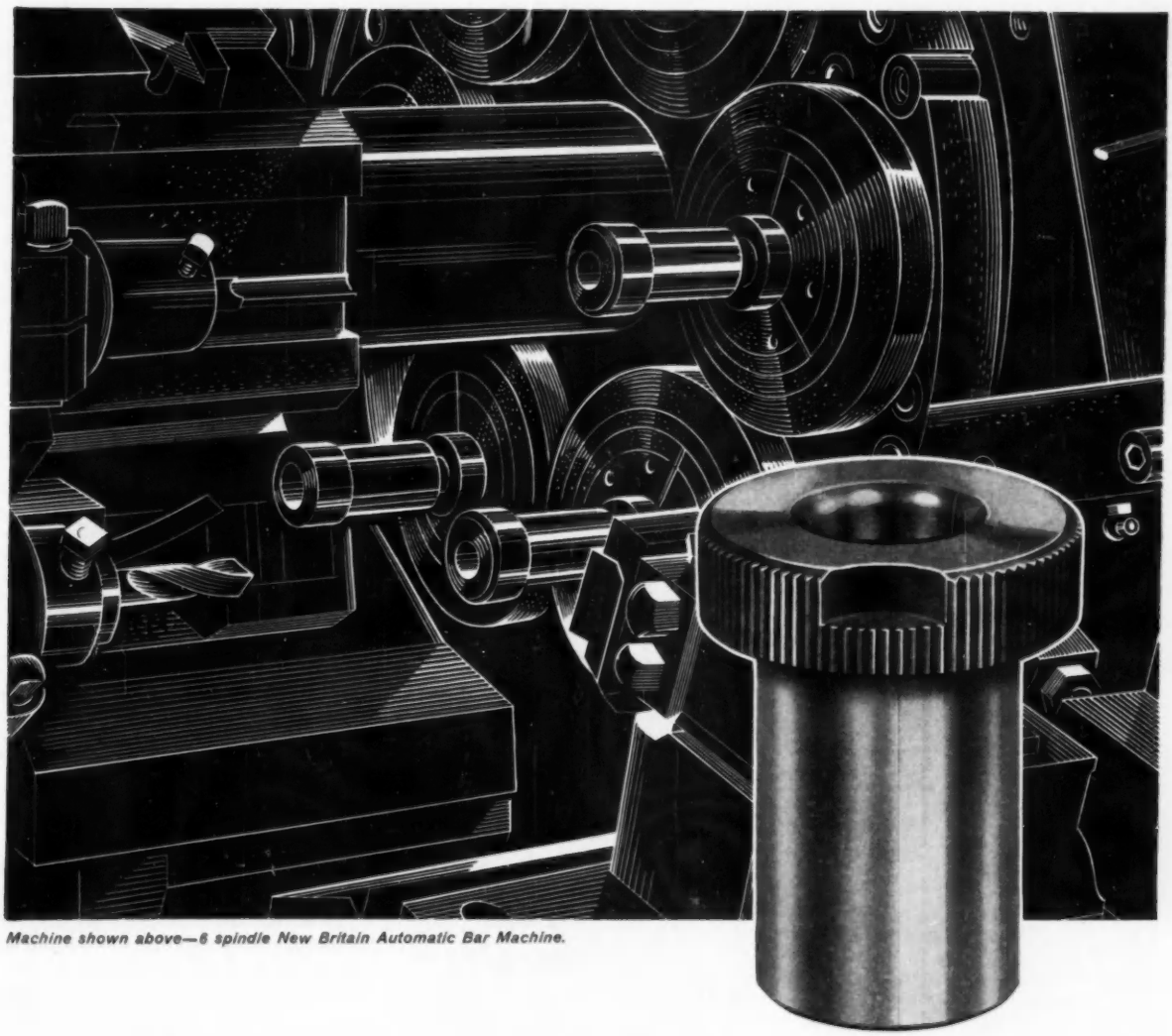
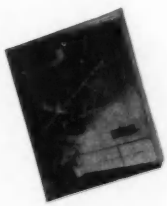


Machine shown above—6 spindle New Britain Automatic Bar Machine.

ARISTOLOY LEADED BOOSTED PRODUCTION 44%

Lubricating effect permitted faster feeds and speeds



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A simple switch from 52100 to 52100 leaded by Universal Engineering Company for this bushing permitted spindle speeds to be increased from 234 to 351 R.P.M. Machine speed was upped from 65 to 90 S.F.M. and feed from .004 to .006 I.P.R. As a result, production of bushings jumped from 89 to 130 pieces per hour. On another bushing, the same lead-treated material increased production from 87 to 124.

In hundreds of like cases, Aristoloy Leaded, the steel with "built-in" lubrication, has helped cut machining time, increased tool life and yielded better finished parts.

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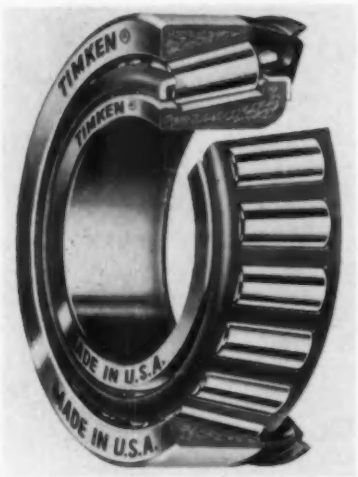
ARISTOLOY STEELS

NEW PRODUCTS
AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Roller Bearing Seals

A device for sealing tapered roller bearings called Duo-face combines features of the outside diam seal and



the face type seal. One lip operates in the bearing housing bore providing an outside diam seal. The other lip works against the smooth, flat, hardened and ground face of the bearing cup providing face type sealing.

No special tools and assembly fixtures are needed where close clearances exist with other machine parts. Adding little width to the bearing, the seal is supplied pressed to the bearing cone. Duo-face seals are available on seven different sizes of bearings. *The Timken Roller Bearing Co.*

Circle 65 on postcard for more data

Bung Type Pump

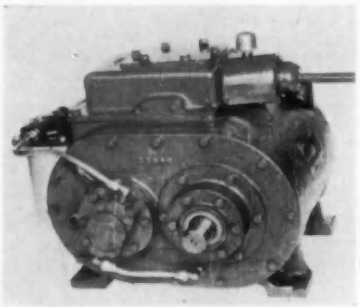
A bung type, air-operated material-handling-pump pumps paints and coatings direct from original drums to paint stations. The 17½ lb unit can supply up to four spray guns, either directly or through a circulating system.

Completely sealed and permanently lubricated, the air-motor is separate from the pump to prevent fluids from harming motor parts. The pumps have 2 to 1 ratios and deliver at the rate of one gpm. They can be inserted into a standard two-in. bung or mounted directly onto the rim of an open 55 gal drum by means of a simple auxiliary clamp. Where constantly mixed coatings are required, an agitator may be mounted with the pump on a portable pump drum cover. All metal parts are electro-plated where necessary, and high density aluminum castings are used to minimize weight. *Binks Mfg. Co.*

Circle 66 on postcard for more data

Power Transmitter

Identified as series 14800-PF, and designed with a self-contained pump and filter along with special oil seals



to keep out abrasive dust in a heavy-duty transmission.

Four speed changes are available with a step-up ratio 1:3 overall or a reduction up to 10:1 overall. It has capacity up to 150 hp. The unit is arranged for horizontal or vertical application and provisions for remote control can be supplied at extra cost. Weight is 300 lb and up. *Western Mfg. Co.*

Circle 67 on postcard for more data

Airborne Inverter

An airborne inverter power supply can invert 27.5 v dc to a regulated source of 115-200 v, 400 cycles ac at a 3500 v amp load. The unit, to be used for various aircraft components, weighs 68 lb, is less than 19 in. long and 11 in. in diam. Named Model 433, it can be factory modified to provide v amp ranging from 1500 to 3500.

A hermetically sealed, potted magnetic amplifier regulator regulates both voltage and frequency. The inverter is packaged in a pressure-tight canister and features an integral heat exchanger. Cooling water is supplied through hydraulic fittings in the canister to circulate through tubular coils surrounding the inverter. Pressurization is accomplished through an air valve located in the canister cover. A completeiy air-cooled version of the inverter is also available. Model 433 inverter can withstand shock up to 100 G or vibration accelerations to 12 G at frequencies from 20 to 2000 cps. *Western Design & Mfg. Corp.*

Circle 68 on postcard for more data

Connecting Device

Remotely operated quick-disconnect couplings (¼ to 2 in. inside diam size) for aircraft and missile applications have various operating methods. They can be disconnected by compressed air, electrical solenoids or by lanyard pullaway, as well as com-

binations of these methods. They can handle compressed air and gases, ordinary and "exotic" fuels, peroxide and similar products. *On Mark Couplings.*

Circle 69 on postcard for more data

Plug-In Circuits

Plug-in electronic circuits are offered in four standard series. The NBS series comprises circuits recommended for use by the National Bu-

reau of Standards. The instrument series includes gate circuits, multivibrators, d-c amplifiers and other instrument circuits. The transistor series features miniaturized plug-in modules in a variety of circuit applications. The general purpose series includes a wide variety of power amplifiers plus control, regulating, and computing circuits.

Smaller sizes are cased in stainless steel, larger sizes in aluminum. Transistor series employ brass cases. Each unit features a permanent schematic on the outside of the case. Tubes used in vacuum tube circuits are premium types, and all plugs are standard. *Dayton Electronic Products Co.*

Circle 70 on postcard for more data

Re-Usable Locknuts

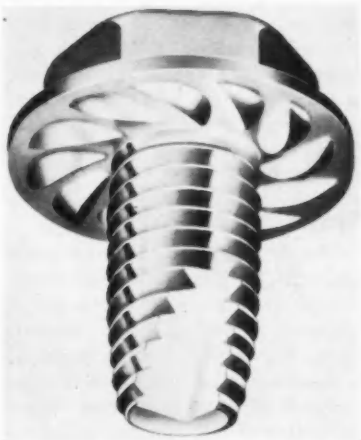
Flexloc locknuts permit fine adjustments to compensate for the wearing of wheel parts. Formed by a single piece of steel with a segmented locking section, they are unaffected by vibration or the solvent action of oils or greases. They require no lock washers, cotter pins or other devices to keep them from working loose.

Eight of the locknuts are used on a line of industrial casters. One ¾ in. thin nut for the pivot point between the caster fork and the forged steel top plate, a second ¾-in. nut holds the axle in place. Six standard ⅜-in. nuts engage ⅜- by ⅝-in. hexagon head cap screws to hold together the two dish-shaped sections of the drawn-steel wheel. Bolted together face to face, the two sections form the flat base rim on which a pneumatic tire is installed. Made in rim sizes from 4 to 12 in. in diam, the wheels will support dynamic loads up to 4270 lb each, at speeds up to 50 mph. *Standard Pressed Steel Co.*

Circle 71 on postcard for more data

Thread-Cutting Screw

Nibscrew, a thread-cutting screw, is applicable in situations where little screw-thread engagement is available.



Protrusions under the head act as the brake, so that the head rather than the threads take up the tightening torque. Sizes are No. 4 through ¼ in. with pan, truss and hexagon washer heads. *Shakeproof, Div. of Illinois Tool Works.*

Circle 72 on postcard for more data

Sensing Device

A single setting variable actuating pressure control, Cat. 130, can sense pressures or vacuums of 0.5 to 40 in. water column. The pressure settings are adjustable by means of an adjusting screw. Fixed on-off differentials ranging from 0.05 to 4 in. water column, depending upon diaphragm sizes, are obtainable.

Controls are suitable for air, gases, liquids or water when using pressure connection. Vacuum connection is usable with air or inert gases. Controls are supplied with dust-tight and splash-proof switch housings with sealed connecting leads.

Electrical ratings of the single pole, double throw contacts are 15 amp at 120-250 v ac, ⅛ hp or 125 v amp pilot duty. *The Herry G. Dietz Co.*

Circle 73 on postcard for more data

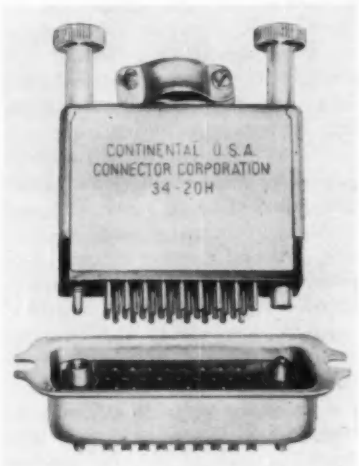
Urethane Adhesive

Developed for laminating and bonding urethane foams to various surfaces, a newly-introduced adhesive, AV24600, is readily applied by conventional methods and is adaptable for heat or pressure-sensitive sealing. It is said to impart immediate high strength, excellent adhesion and flexibility, and to have resistance to water, mold and weathering. The material is a general-purpose adhesive for adhering urethane foam to other foams, wood, fabrics, metal, etc., in the fabrication of urethane foam into manufactured products. *Compo Chemical Co., Inc.*

Circle 74 on postcard for more data

Miniature Connectors

Miniature power connectors for aircraft and electronic equipment requiring high dielectric and mechani-



cal strength are available with 20, 34, 50 or 75 contacts. Voltage breakdown at sea level is 2500 v dc. Current rating is 10 amp continuous. Meeting MIL-C-8384 specifications, the connectors offer aluminum hoods and protective shells as optional accessories. Standard molding compounds include mineral filled Melamine and Plaskon reinforced (glass) Alkyd. Other materials can be fabricated on special order. *Electronic Sales Div. DeJur-Amsco Corp.*

Circle 75 on postcard for more data

News of the

MACHINERY INDUSTRIES

(*Continued from page* 79)

tions, together with selection of the proper drill size, are punched in as numerical data into paper tape. The information read from the punched tape as it is fed into a tape reader automatically controls the position of the table and the drilling of the holes.

Cost Savings

Point-to-point numerical positioning control as applied to a number of specific applications was discussed by Mr. Clark. Accurate positioning need not be confined to linear motion, since rotary tables can be indexed automatically as well. An example given of this is a horizontal-spindle drilling, spotfacing and chamfering machine which has both rotary and linear motions numerically controlled from punched paper tape. It was indicated in this case that anticipated savings of $25,000 yearly will write off the investment in three years.

An automatic spot welder for welding tabs on cylindrical tail pipe liners for jet engines, combining GE numerical positioning control and resistance welding control, was also mentioned. This setup uses punched paper tape. The part contains 1600 spot welds; and the prior manual method required two operators working for 10 hours to complete the job. With numerical positioning control, one operator can load the piece in one minute and the machine automatically completes the welds in an hour and 20 minutes. It was said that with yearly savings of $26,000, the machine and control will be paid for in two years.

Automatic Gaging

Automatic gaging "for the prevention of defectiveness" was discussed by Henry Boppel, Autometrology Div., The Sheffield Corp. His paper was entitled "Present Metrology Spearheads Future Automation Growth." After describing the company's presently-available equipment, he indicated that a high-speed precision electronic gaging system was in process of being developed. It will be usable with air sensing systems or with mechanical contact type gaging systems. The new system will provide, he stated, high speed detection, a wide range of selective amplification, automatic continuous recording, highly selective classifying, and high speed control. It will also provide data processing and statistical computation in a complete gaging system. Future electronic systems, he predicted, will give gaging decision-making functions that can be carried out in conjunction with high-speed control of most operations in an automatic line or plant.

Static Switch

The development of a new static proximity switch for control applications was revealed by Kenneth Lipman, Westinghouse Electric Corp. Having no moving parts, it is considered by its makers to have distinctive advantages from the reliability and life standpoints. Usable is a limit switch, it will detect and signal the presence of ferrous objects during their processing. Formal introduction of this device was understood to be imminent—probably during the next few months.

Motors

Pancake-type machine-tool motors were discussed in a panel session headed by Viljo Hill, Brown & Sharpe Mfg. Co., and manned by representatives from six of the electric motor manufacturers. These flatter, larger-diameter motors have, in most cases, been applied for compactness and appearance reasons. It was agreed that motor efficiency and performance have not be particularly affected when going to the flatter shape. Because of their larger diameter and greater inertia, pancake motors are nevertheless not recommended by the builders for reversing or quick accelerating service. The need for NEMA mounting standards was mentioned, and on this point it was felt the request for such standards would have to be initiated by the machine tool builders.

The characteristics of the Synduction motor, a synchronous-speed induction-type unit in ratings up to 100 hp, were outlined by R. J. Dineen, Allis-Chalmers Mfg. Co. "Motors for Precision Spindles" was the title of another presentation by E. A. Kitsch, Louis Allis Co. In this latter paper the various types of spindle motors were briefly discussed, including rolled shell shaftless motors, frame type shaftless, variable speed spindle motors, and liquid-cooled motors. Design considerations and recommendations for selection were contained in the presentation.

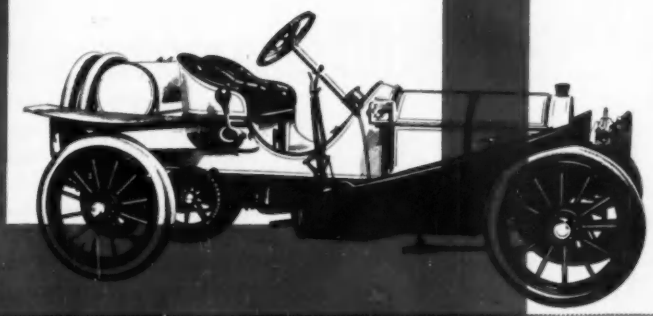
Packaged Control

A new packaged automatic control system for table positioning on drill presses, punch presses, etc., was described by A. F. Brewer, Electronic Control Systems, Inc. Called the Digimatic C-202, it is a point-to-point numerical control using punched paper tape for data input. The equipment consists of three major components: tape preparation unit, tape reader and control unit, and a compound servo table. Workpieces are held and positioned in a horizontal plane. After initial positioning, the control signals the machine for the required operations — the workpiece being automatically moved from position to position until the operations are completed.

Electronic Drives

The conference closed with detailed descriptions of a static press control and four electronic adjustable speed machine tool drives engineered respectively by Clark Controller Co., Reliance Electric & Engineering Co., Raytheon Mfg. Co., Square D Co., and Allen-Bradley Co. A new planer type milling machine, "functionally designed" by Giddings & Lewis Machine Tool Co., was described in conjunction with its Square D control system.

YESTERDAY...



when compression ratios were 3 to 1, any good oil ring would do...as in this rakish Apperson Jack Rabbit, vintage 1907. Guaranteed to turn up 75 miles per hour, the car featured 60 H.P. engine, 4-speed selective type transmission, double ignition with magneto and coil, and carried a price tag of $5,000.

TODAY...

U. S. patents 2,635,022 and 2,695,825

it takes the PC type "98" chrome oil ring!

The Perfect Circle Type "98" Chrome oil ring was specifically designed to meet the exacting demands of today's high-compression engines. Featuring universal application, bottomless and conventional grooves, all depths, the PC Type "98" oil ring was the first to have a patented side-sealing action with multiple tiny springs that exert both side and radial pressure. And of utmost importance, Type "98" Chrome Oil Rings provide maximum oil drainage! Perfect Circle Corporation, Hagerstown, Ind.; The Perfect Circle Co., Ltd., 888 Don Mills Road, Don Mills, Ont.

PERFECT CIRCLE

PISTON RINGS

Preferred by more people than any other brand!

New Silicone Fluids Developed

Two new silicone fluids, one of which has functional lubricity at temperatures up to 700 F, have been developed by the Silicone Products Dept. of General Electric Co. Trademarked Versilube, and designated 81717 and 81644, the fluids provide added flexibility in the design of hydraulic and engine lubricating systems for aircraft and missiles. Fluid 81717 was produced under a development contract with the Wright Air Development Center of the U. S. Air Force; while 81644 is a product of independent silicone research by General Electric Co.

Primarily intended for use in hydraulic systems, fluid 81717 features ability to function at temperatures at which many lubricating fluids will not survive. The material can withstand prolonged use over the —65 to +575 F temperature range, according to concurrent announcements by GE and WADC. It is also claimed that under certain operating conditions, extended service may be attained at temperatures as high as 700 F.

Designed for use in engine and other lubricating systems where oxidation stability is important, fluid 81644 offers increased resistance to oxidation, as well as improved lubricating qualities. It remains stable under exposure to oxygen at temperatures as high as 510 F, some 60 to 80 degrees higher than possible with previous silicone and other lubricants. It is also a somewhat better lubricant than the standard lubricating silicone fluids.

The new products are companions to a third GE chlorophenyl fluid, Versilube F-50, the first of the silicone fluids designed as a lubricant and introduced a few years ago. Versilube F-50 possesses the best thermal stability of any of the three fluids, and is the only one in which additives are not used.

With the development of the two new fluids, systems designers may now select a high temperature silicone fluid for lubricity (81717), for oxidation stability (81644), or for thermal stability (F-50), depending upon the principal need of the application.

During the concentrated development program on high temperature fluids conducted by the Engineering Section of the Silicone Products Dept. over a period of nearly 10 years, new techniques and equipment for testing at temperatures up to 1000 F have been evolved. The equipment includes devices for determining viscosity-temperature relationships, for studying thermal and oxidation stability, and for determining vapor pressure of sample fluids, and a modified Shell four-ball wear tester—all adapted to simulate high-heat conditions.

TYPICAL PHYSICAL PROPERTIES
GE HIGH TEMPERATURE FLUIDS

	Temp. °F	(Centistokes) F-50	81717	81644
Viscosity—Temperature Data (approximate):	—76	3-4000		
	—65		3487	2848
	—40	630-650		
	—30		946	705
	0		390	310
	32	90		
	77		180	
	100	40	71.3	65.6
	210	18	22	22
	300		12.9	13
	450		5.5	5.2
	700		1.9	2.4
Pour Point—below: (all)		—100 F		
Flash Point:		525+F	575 F	560 F
Fire Point:		650+F	620 F	620 F
Auto-Ignition Point—approx.: (all)		800 F		
Bulk Modulus:				
At 75 F—(all)		150,000 psi		
At 700 F—(all)		30,000 psi		
Panel Coking:				
At 600 F after 8 hrs.		0.0 mg	0.0 mg	1.0 mg
At 700 F		240.0 mg		
At 750 F			950.0 mg	3.0 mg

USING

DU PONT ELASTOMERS

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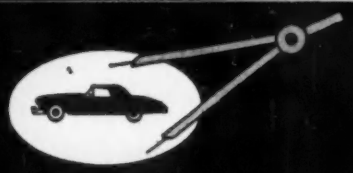


in design

New neoprene hinge cuts installation time on bus door from one hour to 15 minutes

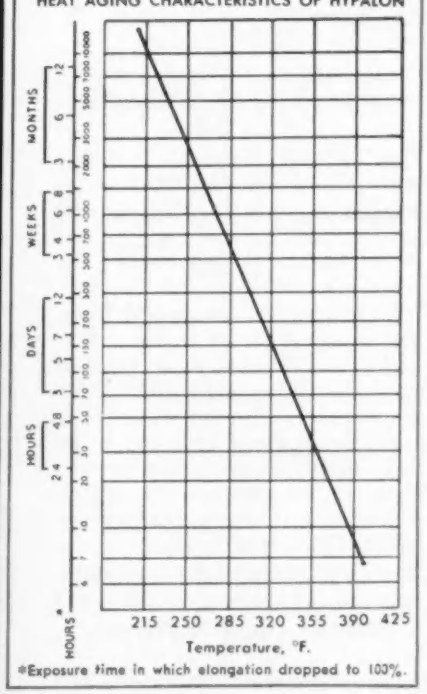
Parts of HYPALON have exceptional heat resistance

Compared with other kinds of rubber, HYPALON shows unusual resistance to hardening at elevated temperatures (250°-350° F.). This means an extra-long service life for belts, hose, gaskets and other parts exposed to engine heat.

The graph below indicates heat aging characteristics of HYPALON. It shows, for example, that compounds of HYPALON will retain 100% elongation after three weeks' *continuous* exposure at 285° F., three months at 250° F. and almost a year at 212° F. Longer service life can naturally be expected where temperatures are intermittent.

Other advantages of HYPALON that are useful in automotive design include its outstanding resistance to sunlight and weather and complete ozone resistance. HYPALON, Du Pont's newest synthetic rubber, can also be made in a variety of light-stable colors. Mail coupon for more details.

HEAT AGING CHARACTERISTICS OF HYPALON



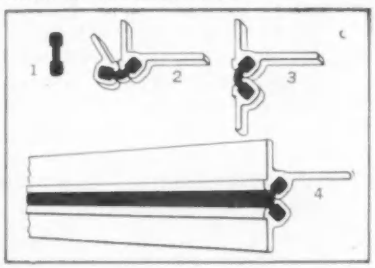
*Exposure time in which elongation dropped to 100%.

Neoprene hinge permits door replacement in 15 minutes. Only 2 pins are required to hold the door securely.

A new neoprene baggage door hinge has been developed by a coach manufacturer to replace metal piano hinges which required 80 rivets per door for installation. With 6 to 10 doors per coach, savings in time and labor costs have been significant. Where installation of piano hinges involved one hour per door, the neoprene hinge is installed in 15 minutes. Two pins drilled into the neoprene strip are all that's required to secure the door after it has been slipped over the hinge.

Neoprene was the logical choice for the hinge because of its exceptional resistance to aging and flex cracking. In laboratory tests, it withstood 1½ million flexing cycles without damage. In service, neoprene withstands the deteriorating effects of sun and weather, ozone and oxidation. Under tension at all times, the neoprene hinge also serves as a seal to keep the elements out of the baggage compartment.

Neoprene's balanced combination of properties makes it practical for a variety of automotive uses. Hose, gaskets and flexible couplings are just a few. This Du Pont synthetic rubber offers many other opportunities for designing new products and improving old ones. Mail coupon below for full information.



1. Hinge 2. Hinge open 3. Hinge closed
4. Hinge makes moisture-tight seal open or closed.

DU PONT

HYPALON *is a registered trademark of E. I. du Pont de Nemours & Co. (Inc.)*

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☐ Send me a free copy of *The Du Pont Elastomers* (a review of properties of neoprene and HYPALON).

☐ Add my name to the free mailing list of the *Elastomers Notebook* (contains articles based on uses of Du Pont elastomers in industry).

E. I. du Pont de Nemours & Co. (Inc.)
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METALS

Steel Consumers Are Deferring New Orders While Reducing Their Inventories. Nickel Supply Continues to Increase

By William F. Boericke

Steel Operating Rate Dips

By mid-November steel production had dipped to a 15-month low level, with scant hope of improvement. Output was less than 2 million tons of ingots per week, with the operating rate falling to 77.5 per cent of capacity. Orders for steel were undeniably disappointing, although some producers were faring better than others depending on product mix. Backlogs were declining, with a slowdown in new orders. Previous forecasts of an 80 per cent operating rate for the fourth quarter have been scaled down.

Total production of raw steel for the year will be about 115 million tons of ingots, but 60.6 million tons were poured in the first half of the year, with output dropping sharply to 54.4 million tons estimated in the second half.

Inventories Unchanged

Steel inventories in the hands of users are little changed from the beginning of the year, according to an *Iron Age* estimate. They mounted sharply in the first quarter of the year, to provide for a heavy fall demand which didn't materialize. This was particularly true for plates, structurals, and oil country goods. As a result, consumers are deferring new orders while liquidating inventories. No doubt actual steel consumption in many lines is exceeding shipments.

However, inventories may be unbalanced. Some users are cutting inventories to escape year-end tax requirements. With mills scrambling for business and promising fast delivery for nearly all products, consumers have no need to order in advance, and are making the mills act as warehouses for them. They can count on steadily increasing supplies as new production facilities are brought in that will raise capacity to about 140 million tons by the end of the year.

Detroit Buying Disappointing

The big disappointment has been the listless buying by the automobile industry. Some slight improvement has been noted from the appliance makers. It all shapes up as a highly competitive market, with mills going out of their way to stress fast delivery and even to absorb freight in order to secure business out of their normal territory.

Improvement Spotty

Some improvement is expected in sheet and strip business in December from the automobile makers. But demand for oil country goods is falling off, including drill pipe, casing, and tubing. Mills geared for heavy structurals are still running close to capacity but demand is lessening. Heavy plate and wide flanged beams are hardest to get. Tin plate is off, and galvanized products are definitely weak.

Fabricated structural steel continues to decline below 1956 levels. The incoming rate of new orders has dipped in every month during 1957. Shipments have been heavy, reflecting increased mill capacity.

Scrap Market in Slump

The scrap market continues to sag. In two months time the price of heavy melting scrap is down $18 a ton, and about $30 a ton from the $67 peak price last winter. Industrial scrap appears as hard hit as dealer scrap. Prices are the lowest in two years. An official of Jones & Laughlin declared his company does not expect to buy any more scrap during the balance of 1957. His company is now using about 78 per cent pig and only 22 per cent scrap in its furnace charge. Mill inventory cutting necessarily has hit the scrap market, with mills generating more home scrap and having less need to buy on the open market.

Over Emphasis on Operating Rate

Too much attention is being paid to operating rate according to some steel officials. It is overlooked that high cost facilities have been taken out of production with new modernized equipment brought in to take their place. The difference in ingot costs between new and old equipment may be as much as $10 per ton. Consequently profits do not drop in ratio with decline in operating rate. A 70 per cent operating rate early in 1958 as forecast by some steel men doesn't mean 70 per cent of the current capacity of 133 million tons, but 70 per cent of the anticipated 140 million tons capacity of 1958, which would be 73 per cent of the present rate.

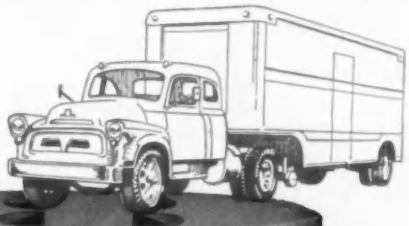
Aluminum in Over-Supply

While it is now freely admitted that there is present overproduction of aluminum, most sellers do not expect to see any change in the markets in the near future. Nevertheless, the statistics are disturbing. The president of Aluminum Ltd. declares frankly that demand during the next few years doesn't look good. Because of this, his company will defer work on expansion of its Kitimat primary aluminum smelting facilities. Alcoa is considering further delaying construction. An official forecasts that the total aluminum supply for 1958 appears to be about 2,700,000 tons, including imports and secondary. This would

(*Turn to page* 102, *please*)

Rapidly becoming the

Standard of the Automotive Industry



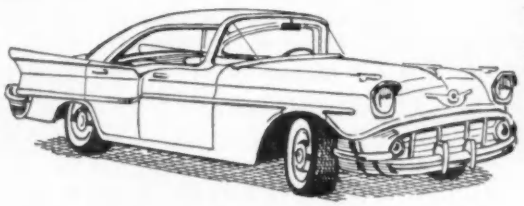
INCREASES ENGINE LIFE UP TO 400%

STERLING'S great "Conformatic" piston with "Intra-Cast" steel ring groove liners give sensationally longer life to rings and grooves—

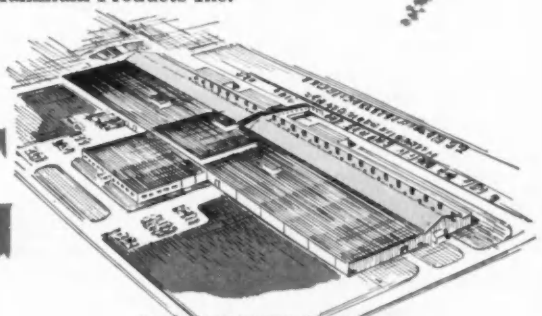
Recommended clearances for "Conformatic" pistons are from 0 to ½ thousandth inch. This clearance is maintained hot and cold providing unbelievable bore stability.

STERLING'S CONFORMATIC PISTON WITH INTRA-CAST STEEL LINED GROOVES

prevents frictional horsepower loss, reduces oil consumption to an absolute minimum, and prolongs engine life up to 400%. *Intra-Cast* and *Conformatic* are registered trade names of STERLING Aluminum Products Inc.



Sterling's revolutionary *Conformatic* piston already has been accepted and is now being used in a number of America's finest and most popular passenger cars.



NEW MANUFACTURING FACILITIES FOR STERLING ALUMINUM

120 acres! Completely new automated plant at the confluence of the Missouri and Mississippi Rivers

STERLING

ALUMINUM PRODUCTS INC.

ST. CHARLES, MISSOURI

SA-1

WORLD'S LARGEST MANUFACTURER OF ALUMINUM ALLOY PISTONS

Observations

By Joseph Geschelin

Industrial Research

Dr. Lawrence R. Hafsted, GM vice-president in charge of research staff, presented some impressive ideas in his talk on industrial research and development at the recent Industry-Navy Research & Development Conference. One of his points was about the exceedingly high cost of research today. And out of this has come the sobering reflection that each research organization must decide what proportion of its budget is to be allocated to commercial development and what proportion for basic research. Under present conditions, research in an industrial (profit-making) organization must be directed into useful channels. How much money and time can be spent on long-range projects is something the research director must decide for himself. One of the interesting questions raised by Dr. Hafsted is this: Why is it that some of the major developments in major fields have come from people outside the particular industry? For example, why were Diesel locomotives developed outside the railroad industry rather than by producers of steam machinery? Why is it that the safety razor and the electric shaver did not originate with the people who manufactured the old fashioned straight razor and are still making them? Is it a mental block? How much of a mental block exists in other areas?

Replacing Machinery

At this particular time it would be well worth while to look at the physical assets of every manufacturing plant to see how much of the machinery and other equipment is too old or obsolete. Considering the great improvements that have been made in machine tools during the past 10 years, the use of an obsolete machine means a loss in profit and a lag behind competition. We do not go along with the idea that the physical age of a given machine is a criterion of its usefulness. We have too many examples of forming machines that are designed to last for 20 to 30 years. But any machine that cannot compete on the basis of productivity, or unit cost, or low maintenance, or quality is obsolete even if it is only a year or two of age. Now is a good time to reinstate the machinery replacement programs that went by the board during the war.

Lead Time

According to Chevrolet's general manager Cole, the program leading to the emergence of its impressive line of cars for 1958 was initiated back in 1953. That gives all of us some impression of the advance planning required to bring in a brand-new model.

Fuel Injection

Much has been written about fuel injection during the past several years. The general impression is that some refinements still remain to be resolved, particularly with respect to good idle and low-speed operation. The line-up for 1958 includes a modified Bendix electronic system which is offered on Chrysler Corp. cars, on the Corvette, and on Pontiac, the latter two being RPD systems. The last word is that Chevrolet supplied over 2500 Corvettes equipped with fuel injection in 1957. The feeling is that the price of the system still is too high for general consumption.

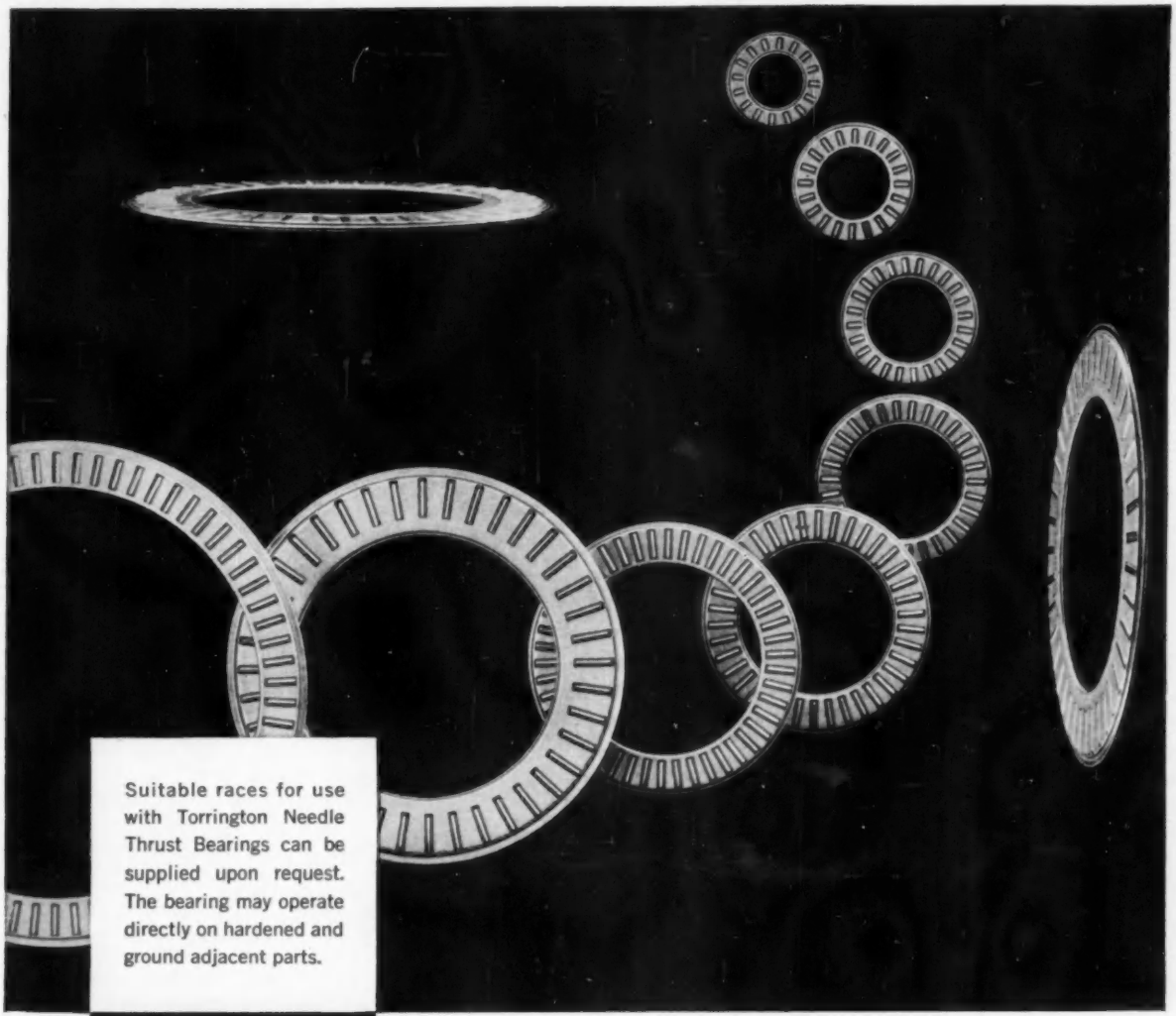
Short Week

We see by the papers that Walter Reuther is determined to press the motor car industry for higher wages and a shorter work week. That is his answer to inflationary pressures that he has repeatedly decried. It is difficult to reconcile his attitude when you consider that rising labor scales coupled with lower amortization rates on expensive equipment must necessarily combine to increase the cost of motor cars still further. Curbstone opinion seems to be that motor car producers will not go along with the unions, unless one of the big three cracks in order to protect its sales position. If they all hold the line, a serious strike would seem to be in view next Spring.

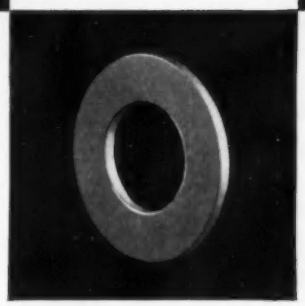
Future Programs

Advances in the automotive industries depend to a large extent upon style and design obsolescence, together with new discovery or important improvements in existing parts and products. Any of these factors taken singly or in combination may give rise to new manufacturing techniques. At the same time manufacturing techniques frequently change and new methods and machinery are introduced to reduce costs, to improve quality, to increase productivity. We are now in a brief period in which many of the costly programs initiated by the larger manufacturers are nearing completion. It is at this stage that we look to new developments and changes in product that will demand another wave of plant construction and new machinery acquisition. This is not a new process. It has occurred in waves for the past 30 years or more in the

(*Turn to page* 120, *please*)



Suitable races for use with Torrington Needle Thrust Bearings can be supplied upon request. The bearing may operate directly on hardened and ground adjacent parts.



Torrington's new Needle Thrust Bearing grows in popularity... and range of sizes

Designers have been quick to take advantage of the compactness, high thrust capacity and low unit cost of Torrington's new Needle Thrust Bearing.

To meet the growing demand for this bearing in automatic transmissions, governors, steering gears, bevel gears, hydraulic pumps, torque converters and many other applications, tooling has been completed to produce bearings ranging from .500" ID to 3.000" ID.

Only .0781" thick, the Torrington Needle Thrust Bearing is thin as an ordinary thrust washer, yet brings all the advantages of anti-friction operation to applications where space is limited. Mating steel retainer halves are joined securely to form a self-contained unit that is easy to handle and install.

Plan today to evaluate the Torrington Needle Thrust Bearing. Services of our Engineering Department are available to help you. For full information, write for Bulletin No. 16, "Torrington Needle Thrust Bearings." *The Torrington Company*, Torrington, Conn.—and South Bend 21, Ind.

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METALS

(*Continued from page* 98)

be a 17 per cent increase over 1957 supply of 2,300,000 tons. Primary production would be about 1,900,000 tons.

In Europe, Russia is selling aluminum about 23 cents a pound landed in U.K. This compares with a domestic price of 26 cents for primary pig.

There are plenty of instances of price cutting in mill products and fabricated goods, and in recent weeks low priced imports have been underselling U. S. products in some localities, although the movement as yet has not attained wide proportions.

It appears that the industry will have a major job on its hands to sell all the aluminum it is capable of producing over the next year or two. While the companies are aware of this, they are just as confident that by 1960-61 they will again face inability to produce sufficient metal to meet demand at that time. This forecast is based on a continuation of the industry's past growth rate of 12 per cent annually in consumption, which it is believed could well be exceeded when increased availability of the metal is guaranteed.

More Production Cutbacks Required

On a world basis, refined copper production is over 21,000 tons more than deliveries, resulting in another increase of stocks to a record of nearly 428,000 tons. In short, cutbacks in production have not been sufficient to date to bring the supply-demand position into balance.

It is perfectly true there is nothing wrong with the copper market that a production cut would not cure. But comparatively few domestic and foreign mines have taken this unpleasant step and there is growing irritation because others have not complied as well. For 10 months of this year, world copper deliveries have averaged 7820 tons per day, as compared with 7740 tons in 1956 and 7519 tons in 1955. Evidently the market demand for copper is not weakening. It would appear that actual consumption is even larger than deliveries would indicate, as there is no doubt that users have been drawing heavily on their inventories and buying only for immediate delivery. Their inventories have not been replenished because consumers are fully aware of the large stocks of copper on hand and are making the producers carry their stocks that would normally be in their own warehouses.

Producers were still holding to their 27-cent price in mid-November but the custom smelters, after advancing to 26 cents, cut back again to 25½ cents.

Lead Firm Following Price Cut

The unexpected cut of ½ cent per lb in the lead price to 13½ cents followed announcement by the British Government that it proposed to sell its remaining 20,000 tons of lead in its stockpile. This metal would be offered gradually on the market starting in December at no more than 3000 tons per month. Domestic demand is holding up well at the new price.

If the expected increase in the lead tariff goes through, it could increase the spread between U. S. and European prices to about 3.4 cents per lb. The cost of insurance and freight, amounting to about 0.84 cents per lb., plus a duty of 2.55 cents, would total this amount. Indication that the higher tariff was sure of approval would probably start heavier exports to this country to get in under the wire.

Nickel Supply Increasing

Nickel markets are easier, both in the U. S. and abroad. Premiums gladly paid in Europe a few months ago have skidded. A price of $1.30 per lb for the consumer was usual —now it's about $1.05 and likely to go lower. Recently electrolytic cathodes were sold as low as 70 cents per lb. But no one anticipated that the major Canadian producer would cut its price of 74 cents a lb f.o.b. plants including U. S. duty. U.S. industry will get additional supplies of 58,500 tons this year and 67,500 tons in 1958 of nickel originally intended for the stockpile. This might mean that industrial users won't be able to absorb all of the output, and some will go to Europe to relieve the shortage there. Canadian production continues to climb, up about 6000 tons in the first half of the year. An International Nickel official has asserted that Inco will have to find new markets for its Mystery Lake output during the next few years. It means that civilian use will have to increase 75 per cent to absorb the expansion. But it is likely that nickel will find increasing use in the field of high temperature materials, and the present emphasis on stepped-up defense will undoubtedly increase the demand.

Zinc Unchanged

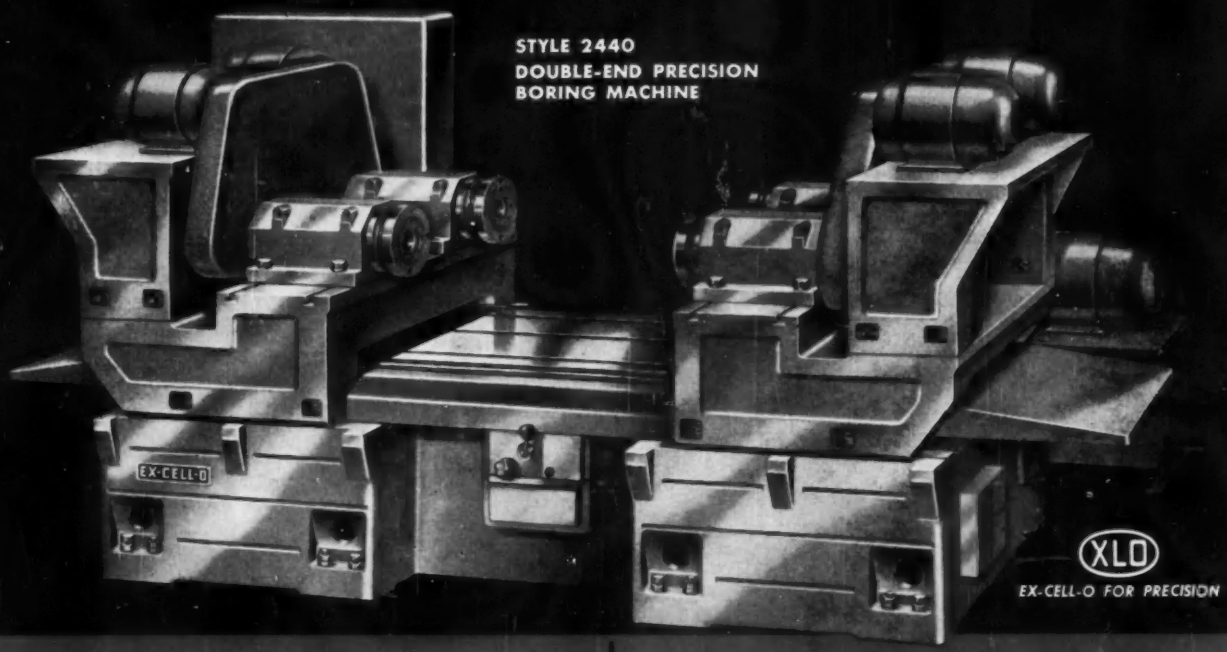
Zinc statistics for October give scant comfort to producers. Slab production continued to exceed total shipments, including deliveries to the Government stockpile, and stocks of metal on hand at the end of the month registered another new high of nearly 156,000 tons. Unfilled orders showed a decrease from September.

No doubt part of the weakness in zinc results from proposed sales of substantial tonnages by the British Board of Trade, scheduled for December and January. Domestic lead and zinc producers expect their petition to the Tariff Commission for higher tariffs will be expedited so that favorable action will occur before the year end.

October Copper Deliveries Improve

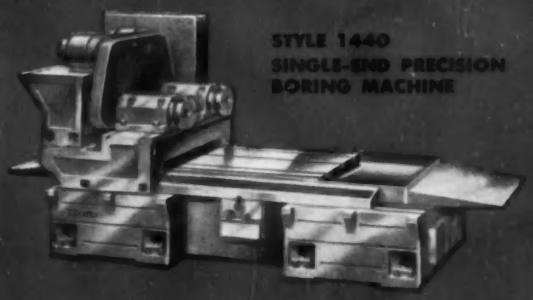
Release of the October figures by the Copper Institute brings mixed emotions. Considering only the statistics for the United States there is some room for satisfaction. Deliveries to fabricators during the month climbed to 114,203 tons, the highest figure since May, and refined stocks at the end of October fell nearly 10,000 tons, or 25,000 tons below the peak 193,000 tons at the end of August. Mine production, however, failed to register an expected decrease and was up some 5500 tons over September.

announcing



STYLE 2440
DOUBLE-END PRECISION
BORING MACHINE

XLO
EX-CELL-O FOR PRECISION



STYLE 1440
SINGLE-END PRECISION
BORING MACHINE

TWO NEW HEAVY DUTY PRECISION BORING MACHINES

57-76

EX-CELL-O BORING MACHINES perform better because of deep-down solid construction, high precision and exceptional versatility. The minute you put one to work profits go up, operating costs go down. And these two new additions to the Ex-Cell-O line are no exceptions:

DOUBLE-END STYLE 2440: This new double-end Ex-Cell-O machine, designed for large workpieces, combines capacity and rigidity for bulky parts while allowing for multiple-station high production work on smaller parts. Spindle bridges can be moved together or spread apart to suit the workpiece.

SINGLE-END STYLE 1440: This new heavy-duty precision boring machine is identical to the 2440 (above) except that it is equipped with one bridge for single-end operations.

Whichever model fits your particular production requirements—you'll find their rugged versatility performs a wide range of rough, semi-finish, and finish operations which lowers your per-unit costs, increases your potential profit.

For further information, call your local Ex-Cell-O Representative. He'll provide all the facts about these two new machines. Or, write direct to Ex-Cell-O.

EX-CELL-O CORPORATION *Machinery Division*
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Report from the

FARM EQUIPMENT INDUSTRY

By Kenneth Rose

INTERNATIONAL Harvester Co. has just announced a new model tractor to fit into its line between the small Cub and the larger Model 350. The new tractor will be known as the Model 330. The 350 and 330 are utility tractors that have been designed with an eye to industrial applications. The Cub is basically a small farm-type tractor.

The Utility 350 tractor has a horsepower rating of 40.57 on the drawbar, and weighs 3502 lb. The Utility 330 model has a horsepower rating of 31.5 on the drawbar, estimated, and weighs 3400 lb. Both are low clearance tractors designed to use such attachments as the backhoe and front end loader.

International Harvester reports making arrangements with the Cone Automatic Machine Co., Windsor, Vt., and Wagner Iron Works, Milwaukee, whereby the backhoes and front end loaders made by those companies can be purchased as attached items on International Harvester's utility-type wheeled tractors. International will purchase the attachments from these two suppliers, attach them in its own shops, and sell the tractor and attachments to its dealers on order. Both Cone and Wagner companies will supply International Harvester with service parts that will be carried in stock in Harvester's parts depots. The supplying companies will perform certain service, product-training, and sales promotion functions with Harvester's dealers and sales personnel.

The new John Deere No. 8 Caster-Wheel mower works with practically any tractor. It's available with hydraulic lift through a remote cylinder, as shown, or with cable lift from the rockshaft.

The new John Deere 3-Point-Hitch mower provides the convenience of 3-point attaching and detaching. It's cleanly designed, ruggedly built, fully protected for many years of high-speed operation.

JOHN DEERE has announced two new power mowers to be added to its line of agricultural implements, both intended to be tractor-towed. The No. 8 Caster-Wheel mower, which can be used with practically any tractor, has a single caster-wheel to make it flexible in use under all field conditions. It will cut cleanly over ridges and through swales. The No. 9 Three-Point-Hitch mower is much like the No. 8, except that it is built for use with any standard three-point hitch. Both models have a roller chain drive, slip-clutch-protected, fully enclosed, and running in an oil bath; a 28-lb flywheel, and a safety spring release, permitting the cutter blade to swing back if it should hit an obstruction.

IRC

continuous process rayon helps give the '58 CHRYSLER

THE "FORWARD LOOK" ON THE INSIDE!

FABRIC BY CHATHAM MFG. CO.

Every item in the new Chrysler must contribute to the Forward Look... must be "years ahead" in styling, design, function.

That's why—again in 1958 as in 1957—the Chrysler Windsor features upholstery fabric made with IRC Continuous Process Rayon. No other yarn dyes so evenly, without a trace of streaking. "Seconds" are drastically reduced, mill efficiency rises to new heights.

So if you work with "critical" fabrics—and automotive upholstery is high on the list—specify Continuous Process Rayon.

I·R·C

Industrial Rayon Corporation
Cleveland, Ohio

Producers of Continuous Process Rayon Yarns and Tyron® Cord for Tires
Sales Office: 500 Fifth Ave., New York 36, N. Y.

Use IRC Continuous Process Rayon...uniform mile after mile... perfect inch by inch... and it costs no more!

• • INDUSTRY STATISTICS • •

1957 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending Nov. 16	Weeks Ending Nov. 9	Year to Date 1957	Year to Date 1956
PASSENGER CAR PRODUCTION				
Hudson	.....	.....	1,345	6,605
Nash	.....	.....	3,561	15,846
Rambler	3,255	3,281	89,316	69,156
Total—American Motors	3,255	3,281	94,222	91,607
Chrysler	2,064	2,248	107,560	88,607
De Soto	2,414	2,659	109,229	84,684
Dodge	5,856	5,767	266,017	166,731
Imperial	698	685	34,509	*
Plymouth	11,786	12,484	591,029	375,412
Total—Chrysler Corp.	22,798	23,843	1,108,344	715,434
Edsel	502	745	51,634	.....
Ford	36,723	38,140	1,334,813	1,150,804
Lincoln	797	739	32,824	42,504
Mercury	5,247	4,758	247,746	207,619
Total—Ford Motor Co.	43,269	42,382	1,667,017	1,400,927
Buick	10,946	10,178	345,793	457,713
Cadillac	3,311	3,159	133,136	119,774
Chevrolet	38,943	35,543	1,276,653	1,411,645
Oldsmobile	9,704	8,965	331,789	372,264
Pontiac	8,233	7,934	291,419	289,067
Total—General Motors Corp.	71,137	65,779	2,378,782	2,650,463
Packard	40	11	4,721	13,299
Studebaker	1,796	1,443	60,803	71,626
Total—Studebaker-Packard Corp.	1,836	1,454	65,524	84,925
Checker Cab	81	90	3,504	3,526
Total—Passenger Cars	142,376	136,829	5,317,443	4,946,882
TRUCK AND BUS PRODUCTION				
Chevrolet	8,308	8,265	307,356	311,857
G. M. C.	1,637	1,632	60,331	81,949
Diamond T	132	125	5,034	4,645
Divco	.....	.....	2,499	3,161
Dodge and Fargo	1,714	1,792	68,841	79,421
Ford	6,053	6,127	301,905	268,872
F. W. D.	14	11	959	1,515
International	2,415	2,202	106,276	119,624
Mack	323	336	15,235	16,164
Reo	103	101	4,244	3,485
Studebaker	126	138	8,496	13,151
White	234	229	12,649	15,686
Willys	1,110	1,578	65,727	55,455
Other Trucks	75	80	3,725	5,849
Total—Trucks	22,246	22,616	963,179	980,734
Buses	55	60	3,509	3,817
Total—Motor Vehicles	164,677	159,505	6,284,131	5,931,433

* Included with Chrysler.

RETAIL CAR SALES BY PRICE GROUPS*

NUMBER OF CARS

Price Group	September 1957 Units†	September 1957 % of Total	September 1956 Units†	September 1956 % of Total
Under $2,000	1,361	.29	65,641	15.85
$2,001 to $2,500	302,885	63.72	232,734	56.20
$2,501 to $3,500	135,626	28.53	98,709	23.84
Over $3,500	35,452	7.46	17,016	4.11
Total	475,324	100.00	414,100	100.00

Price Group	Nine Months 1957 Units†	Nine Months 1957 % of Total	Nine Months 1956 Units†	Nine Months 1956 % of Total
Under $2,000	22,548	.51	813,852	17.89
$2,001 to $2,500	2,816,826	63.10	2,516,925	55.34
$2,501 to $3,500	1,266,814	28.38	1,032,353	22.70
Over $3,500	357,684	8.01	184,878	4.07
Total	4,463,874	100.00	4,548,008	100.00

DOLLAR VOLUME OF SALES

Price Group	September 1957 Dollars	September 1957 % of Total	September 1956 Dollars	September 1956 % of Total
Under $2,000	$ 2,078,247	.17	$ 128,760,479	13.28
$2,001 to $2,500	661,776,150	54.45	499,675,364	51.53
$2,501 to $3,500	383,065,848	30.59	268,102,007	27.66
Over $3,500	185,201,623	14.79	73,065,559	7.54
Total	$1,252,121,868	100.00	$ 969,603,409	100.00

Price Group	Nine Months 1957 Dollars	Nine Months 1957 % of Total	Nine Months 1956 Dollars	Nine Months 1956 % of Total
Under $2,000	$ 40,424,140	.35	$1,583,547,500	14.96
$2,001 to $2,500	6,330,738,629	54.14	5,409,055,052	50.85
$2,501 to $3,500	3,577,393,263	30.59	2,842,677,584	26.72
Over $3,500	1,744,784,320	14.92	793,028,923	7.45
Total	$11,693,340,352	100.00	$10,638,309,059	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four-door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

NEW REGISTRATIONS OF FOREIGN CARS

First Nine Months

1957		1956	
Volkswagen	46,209	Volkswagen	36,757
Renault	15,654	Metropolitan	5,135
British Ford	11,392	M. G.	3,674
M. G.	10,504	Jaguar	2,763
Metropolitan	9,170	British Ford	2,515
All Others	51,980	All Others	17,821
Total	144,909	Total	68,665

1957 NEW REGISTRATIONS

Based on data from R. L. Polk & Co.

NEW PASSENGER CARS

Make	September 1957	August 1957	September 1956	NINE MONTHS 1957	NINE MONTHS 1956
Ford	121,154	123,632	87,282	1,145,985	1,010,736
Chevrolet	123,181	117,744	116,519	1,098,773	1,209,036
Plymouth	49,857	54,926	31,117	480,176	377,632
Buick	28,323	29,757	40,604	307,715	431,130
Oldsmobile	29,827	28,643	32,148	286,697	350,495
Pontiac	25,823	25,035	25,310	249,819	282,559
Mercury	21,803	22,310	21,860	212,872	219,223
Dodge	21,183	22,589	15,400	204,896	170,731
Chrysler	11,545	10,794	8,325	109,614	93,748
Cadillac	11,931	11,079	10,903	106,179	109,910
De Soto	7,901	7,750	6,960	81,536	79,005
Rambler	4,973	7,326	4,993	66,102	54,868
Studebaker	4,551	5,784	4,742	48,254	62,384
Lincoln	2,777	2,644	2,819	27,311	33,225
Metropolitan	1,361	1,336	715	9,170	5,135
Nash	726	611	1,655	8,185	20,287
Edsel	7,566	.....	.....	7,566	.....
Packard	352	392	1,837	4,531	25,392
Hudson	269	265	726	4,124	9,592
Continental	23	37	87	598	1,265
Misc. Domestic	363	358	217	3,350	2,942
Foreign	19,726	18,827	6,800	135,739	63,530
Total—All Makes	495,217	491,838	421,021	4,801,195	4,612,825

NEW TRUCKS

Make	September 1957	August 1957	September 1956	NINE MONTHS 1957	NINE MONTHS 1956
Chevrolet	27,390	27,409	24,146	228,354	229,592
Ford	25,524	24,442	21,587	211,117	204,324
International	9,213	8,897	9,156	72,448	83,418
G. M. C.	5,275	5,341	6,583	47,955	64,174
Dodge	4,173	4,096	4,394	36,515	44,098
Willys Truck	1,166	1,124	1,201	11,167	10,059
Mack	1,072	1,171	1,056	10,067	10,023
White	898	1,154	1,208	9,992	11,818
Studebaker	461	506	635	5,296	7,189
Willys Jeep	555	602	861	4,793	6,403
Diamond T	240	305	286	2,572	3,048
Divco	169	182	262	2,033	2,480
Reo	143	157	235	1,686	2,261
Kenworth	149	57	114	840	1,027
Brockway	58	55	48	521	711
Peterbilt	37	43	42	398	454
F. W. D.	26	33	24	353	334
Misc. Domestic	78	65	144	647	881
Foreign	1,537	1,414	436	10,386	3,368
Total—All Makes	78,156	77,053	72,420	657,138	685,662

MORE EFFICIENT DESIGN, IMPORTANT SAVINGS, SIMPLIFIED ASSEMBLY, BETTER APPEARANCE

These are some of the many benefits reported by Design Engineers who have adopted TRU-LAY PUSH-PULLS for remote control operations on literally hundreds of products

Here are typical comments recently received from equipment manufacturers whose machines or implements are equipped with these accurate and dependable remote controls:

Saves Time, Labor and Material
"The use of your flexible Push-Pulls saves us a great deal of time, labor and material. The old linkages frequently required much planning in both engineering and shop which is not required now. On some of our equipment we use Push-Pulls from 10 to 30 feet in length. They operate clutch controls on the Main Power Unit, Feed Conveyors and Delivery Conveyors."

Greater Flexibility of Design
"The principal advantage of Tru-Lay Push-Pulls in our application is that they permit flexibility in locating the control valve in relation to the operator's position."

Cost Less to Install
"Tru-Lay Push-Pulls are easier and less expensive to install than linkages for remote control of power take-off, brake and clutch. Better appearance, too."

Simple and Neat
"For several models of farm tractors, we selected your controls for their simplicity and neatness of application as governor controls."

Solution to Tough Problem
"Can be installed where straight rods are impossible . . . for Remote Control of transmissions, brakes and clutches."

Eliminates Maintenance
"Simple operation and elimination of maintenance problem are the major advantages in using your Push-Pulls."

Reduces Number of Parts
"Your Push-Pulls have eliminated links, radius rods and other lost-motion devices for remote control of hydraulic valves."

Provide ACCURATE Control
"Tru-Lay Push-Pull control cables provide minimum back-lash, even in installations up to 30 feet in length, because the cable is designed to close tolerances with minimum drag and lost motion."

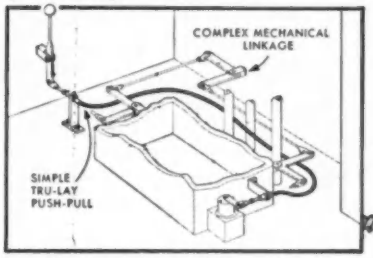
• • •

TRU-LAY PUSH-PULLS are "Solid as a rod but *Flexible* as a wire rope." This flexibility makes it possible to snake around obstructions . . . permits the ideal arrangement of all elements of remote controls.

***Advantages** of Tru-Lay Push-Pull flexibility and simplicity are pictured below—*

Simplicity vs Complexity

Compare the TRU-LAY PUSH-PULL cable in illustration with the mechanical linkage. PUSH-PULLS are simple, have but one moving part, are noiseless and give lifetime service accuracy. Linkages are complex, made of many parts; they wear at many points. Their use brings increased backlash, lost accuracy and vibration rattles.



Construction Equipment and **Farm Implements** provide good examples of the wide-spread use of these accurate, simple and dependable Push-Pulls. On Power Shovels, Winches, Graders, Road Oilers, Dump Trucks, Snow Plows, Engine-driven Pumps, Crushers, Tractors, Combines, Corn Pickers, Corn Row Sprayers, Corn Detasslers, Orchard Sprayers, Power-driven Tree Trimmers, Tobacco Picking Machines and others . . .

TRU-LAY PUSH-PULLS are operating unfailingly for the remote control of Hydraulic and Air Valves, Brakes, Clutches, Transmissions, Throttles, Chokes, Governors, Power Take-Offs, Spray Nozzles, Vent Directional Fins and on many other applications.

ACCO *Our DATA FILE will answer all further questions*

AUTOMOTIVE and AIRCRAFT DIVISION
AMERICAN CHAIN & CABLE

601-H Stephenson Bldg., Detroit 2
2216-H South Garfield Ave., Los Angeles 22 • 929-H Connecticut Ave., Bridgeport 2, Conn.

There is No Worry about Failures or Maintenance Costs with TRU-LAY Push-Pull Remote Controls

Long Life is a matter of record. We have never heard of a Tru-Lay Flexible Push-Pull Control wearing out in normal service. Failures, that sometimes harass users of more complex controls, are eliminated by the use of these simple, positive-action controls.

Dependable Operation of these controls is a certainty, even under the most adverse conditions . . . HOT as jet engines (note: Tru-Lay Push-Pulls are actually performing on hot jet applications) . . . COLD to 70° F below zero . . . SOAKIN' WET . . . ABRASIVE . . . or just plain TOUGH.

Freedom from Trouble is assured because of such features as . . . full protection of the inner, working member by the tough flexible conduit . . . lubrication of the inner, working member *for life* during assembly . . . seals that keep moisture, dust and other foreign matter out of the unit . . . cold swaging of fittings that makes them integral parts of the control unit.

Accuracy is inherent in the basic design of Tru-Lay Push-Pulls. They are precision products, not gadgets.

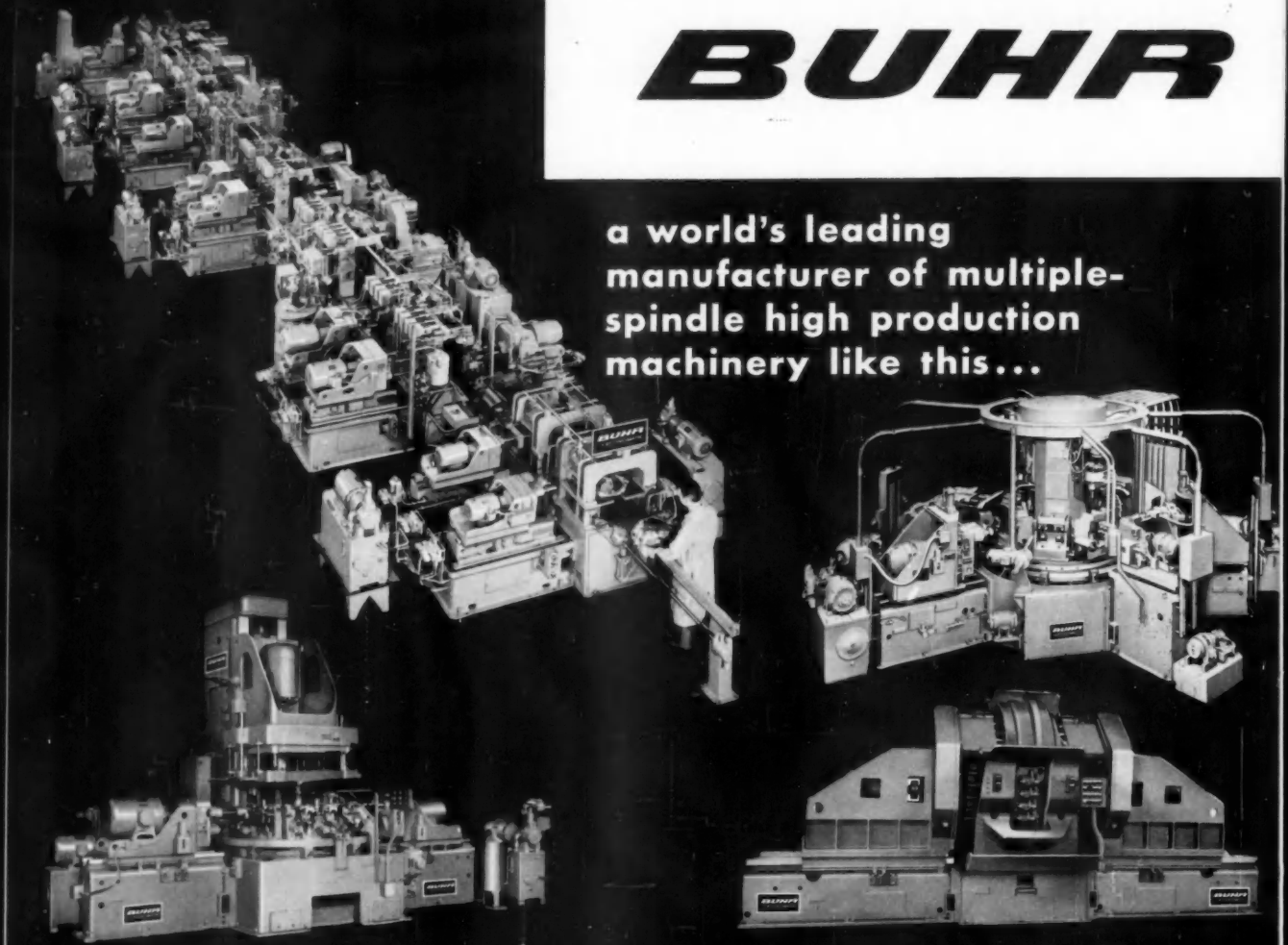
Capacity ranges from light jobs up to jobs of 1,000 lbs. input. These Push-Pulls will handle jobs 150 feet or more from the control point.

"Solid as a rod, Flexible as a wire rope" aptly describes Tru-Lay Push-Pull Controls. This flexibility provides positive, remote action whether anchorages are fixed or movable . . . it damps out noise and vibration . . . it greatly simplifies installation of controls by reducing the number of working parts and by making it possible to snake around obstructions.

Adaptability to all sorts of mechanical situations explains, in large measure, the wide-spread application of Tru-Lay Push-Pulls. Standard anchorages, fittings and heads have been designed that meet requirements on approximately 80% of the installations. Simple modifications of these standards, or minor changes in your own design, cover almost every special situation. Our engineers have the know-how on such matters, and will work with you.

For Further Information—The DATA FILE pictured at the left contains six booklets and bulletins that will answer any further questions you may have about this versatile and dependable tool. It is quite likely that this material will point the way to a simplified solution of your remote control design problems. Write for a copy.

BUHR



a world's leading manufacturer of multiple-spindle high production machinery like this...

the record . . .

Since 1912, Buhr has grown steadily to its present position as a world leader in the manufacture of special automation machinery.

Wherever special metal-working machinery is purchased, BUHR ECONOMATICS are well-known for Quality and Performance.

BUHR MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

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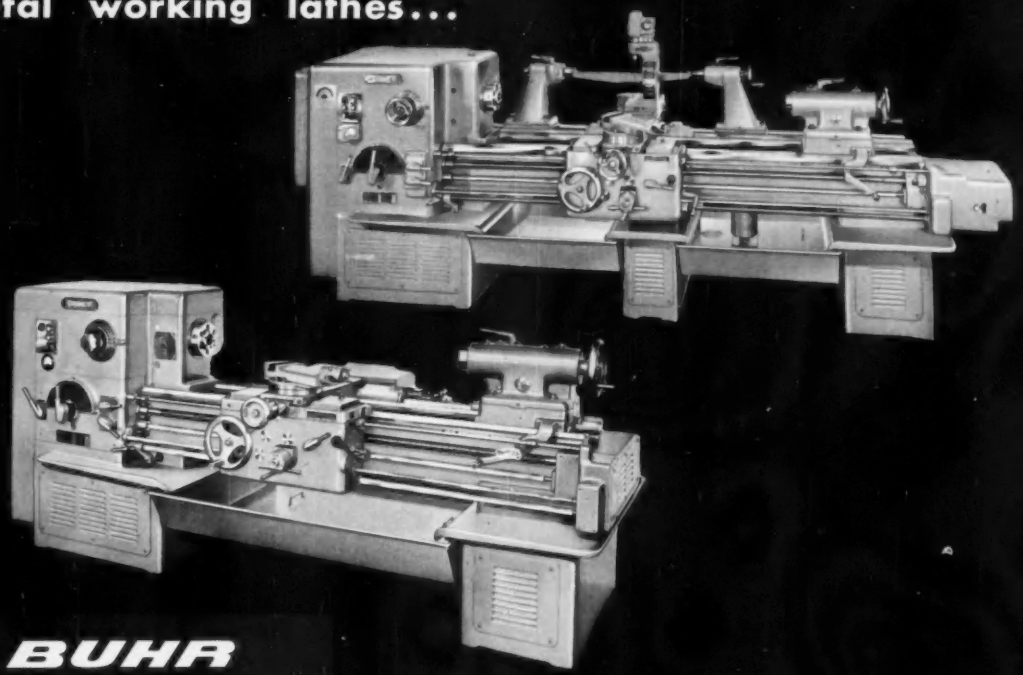
ACQUIRES SIDNEY

assumes full control of producing one of the nation's finest lines of precision heavy-duty metal working lathes...



BUHR plans at SIDNEY...

1 **continue the present line** of Sidney engine and precision toolroom lathes, as well as the Sidney Fluid Tracer in the conventional- and universal-type.

2 **expand the Sidney line** to cover a wider range of sizes and applications.

3 **increase manufacturing facilities** to integrate production and assure better delivery.

4 **merchandise Sidney Lathes** with the same aggressiveness which has characterized the selling efforts of the Buhr organization.

SIDNEY... a fine name in lathes... will be even FINER!

SIDNEY

SIDNEY MACHINE TOOL CO.

SIDNEY, OHIO

Wholly-Owned Subsidiary of Buhr Machine Tool Co.

"We would not consider ordering new equipment without this clutch"
... says D. H. Stoddard
Equipment Superintendent
Arkansas Motor Freight Lines, Inc.
ABF
675

He's talking about the *Lipe* Heavy-Duty Direct Pressure Clutch

"Since July, 1955," says Mr. Stoddard, "we have some 100 more heavy units equipped with the Lipe Direct Pressure Clutches. Some sixty units were so equipped as original specifications, with the remainder being change-overs from other makes and types of clutches.

"We are at present taking delivery of the first of 122 Model DF869 Diesels, all equipped with the DP clutch. From our past experience, we would not consider ordering new equipment without specifying this clutch. We operate some 1,500,000 miles per month, and . . . *we have not had one wear out or burn out.*"

If you would like trouble-free clutch performance like that of Arkansas Motor Freight in your vehicles . . . write today for complete details on the Lipe DP Clutch . . . now available in five sizes for engines developing from 300 to 1300 ft-lb of torque.

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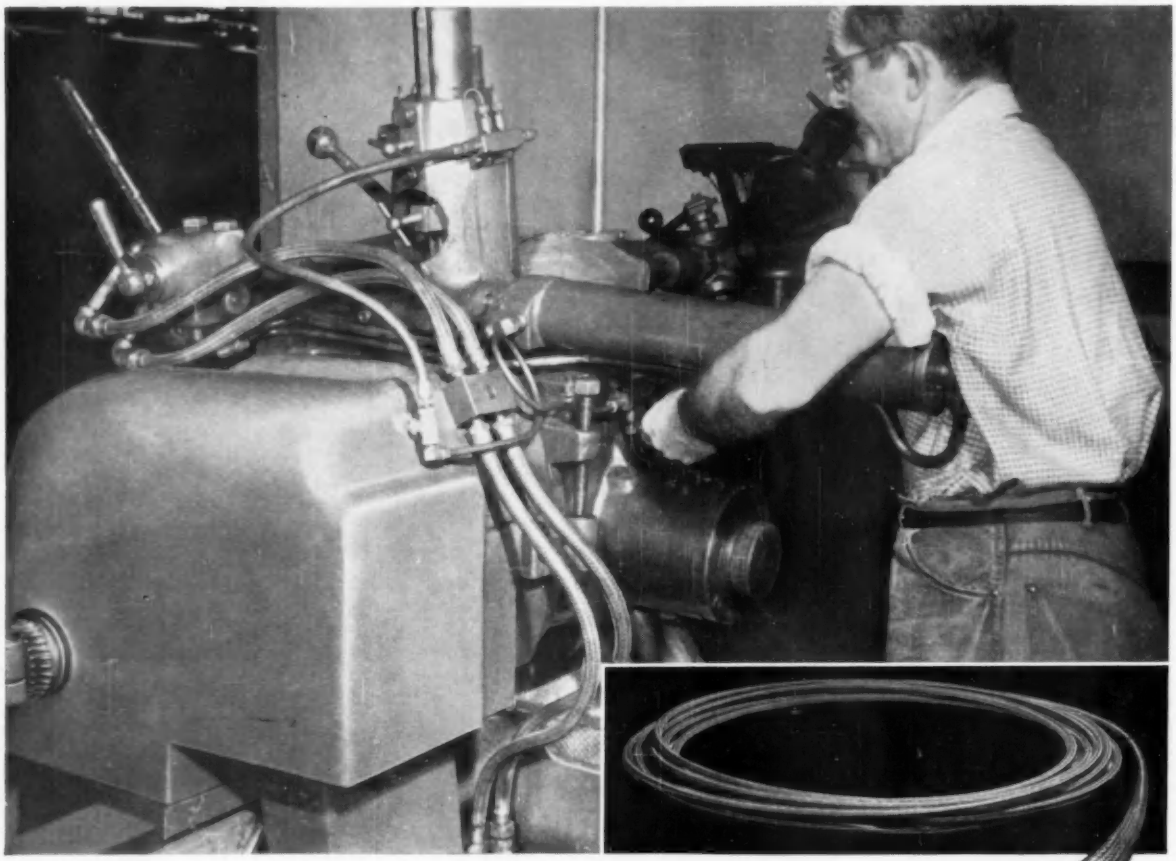
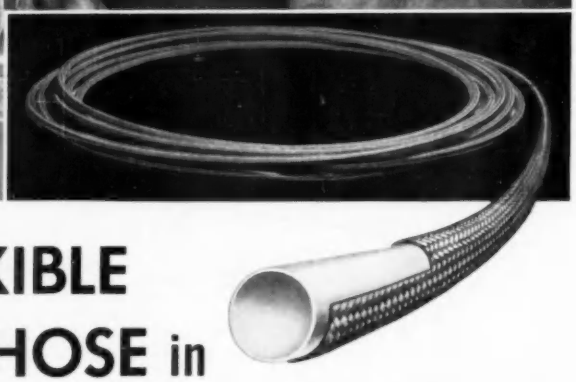




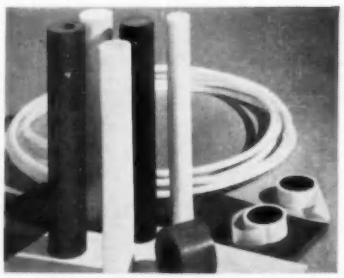
Where to use R/M FLEXIBLE THIN-WALL Teflon* HOSE in automotive and aircraft applications

Wherever corrosive fluids, high mechanical stresses, or extreme ambient temperatures are involved in lines which must handle fuels, lubricating oil or hydraulic fluid, R/M Flexible Thin-Wall "Teflon" Hose provides easy solutions to difficult problems.

For example, take the precision centerless grinder above, which is used in the manufacture of critical aircraft components. Lines supplying its hydraulic infeed drive system must be flexible. They must handle cycling pressures in the range of 75 to 90 psi. R/M Flexible Thin-Wall "Teflon" Hose was found ideal for this troublesome application. It offers equal advantages in countless difficult aircraft and automotive applications, for it serves continuously in temperatures ranging from −100 to 400°F without failure, lasts many times longer than similar hose of other materials, and is unaffected by aging or the highly corrosive agents it may encounter.

R/M Flexible Thin-Wall "Teflon" Hose, with wire-braided or rubber cover, is available through leading coupling manufacturers. We have pioneered in the development of products of "Teflon" for use in the automotive and aircraft fields. Write us for complete specifications on R/M "Teflon" products and name of nearest supplier.

*A Du Pont trademark



Other R/M "Teflon" products for the automotive and aviation industries include rods, sheets, tubes and tape; centerless ground rods held to very close tolerances; stress-relieved molded rods and tubes; and Raylon, a mechanical grade of "Teflon" with many of the properties of virgin "Teflon." For details, call or write R/M.

R/M

RAYBESTOS-MANHATTAN, INC.

PLASTIC PRODUCTS DIVISION, MANHEIM, PA.

FACTORIES: Manheim, Pa.; Paramount, Calif.; Bridgeport, Conn.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Engineered Plastics • Asbestos Textiles • Mechanical Packings • Industrial Rubber • Sintered Metal Products • Rubber Covered Equipment Abrasive and Diamond Wheels • Brake Linings • Brake Blocks • Clutch Facings • Laundry Pads and Covers • Industrial Adhesives • Bowling Balls

Accelerated Salt Spray Tests

(*Continued from page* 55)

chromium plated steel in service. The following modification of the salt spray test appeared to hold the most promise.

Saturator tower temperature: 130 to 135 F

Salt fog chamber temperature: 120 F plus 2 minus 1 F salt solution: 5 gallons of distilled water

5% by weight sodium chloride

5½ grams cupric chloride PH 3.2 adjusted with glacial acetic acid less than 0.0001% iron

Fog collection rate: 1 to 2 ml per hour per 80 sq cm.

This modification produced accelerated corrosion on anodized aluminum and copper-nickel-chromium plated steel in 24 to 48 hours which was approximately a duplicate of that achieved by 192 hours of acetic acid salt spray testing.

Research was then extended to anodized aluminum, copper-nickel-chromium plated aluminum, copper-nickel-chromium plated steel, cadmium plated steel, zinc plated steel, copper-nickel-chromium plated zinc die castings, and rust inhibiting oils and compounds on steel. Some of these tests have been summarized in table 2.

To those who have investigated salt spray tests it is readily apparent that the arbitrary neutral salt spray specifications of 24, 72, 144 hours, etc., "without evidence of pinholes," will not differentiate between the corrosion characteristics or quality of the samples tested, but is merely a measure of the gross porosity of the plating.

Previous mention was made of the essential factors which an accelerated corrosion test on plating must embody. Neutral salt spray fails to fulfill many of these factors, acetic acid salt spray has the drawback of being time consuming, but the accelerated salt spray appears to successfully meet all requirements. Refer to Table 5.

With the start of production of the 1957 model the Cadillac Motor Car Division has been using the "Accelerated Salt Spray Test" for quality control testing and research investigation of factors that effect the quality of anodized and plated parts. Many factors have been presumed to effect the quality of anodizing and of plating with copper-nickel-chromium that still need investigation.

1. Brighteners
2. Accelerators
3. Anode purity
4. Plating solution temperatures
5. Current density
6. Impurities in the bath
7. Bath concentrations.
8. Effect of dyes in anodized aluminum
9. Effective sealing of anodized aluminum

The accelerated salt spray test will hasten these investigations and result in improvements in anodizing and plating that will reflect in improved quality and reduction in corrosion.

It has been recognized that this test has some short-comings, namely the rating method now used with the test needs considerable refinement (refer to Table 3), acceptance standards must be established, and a correlation must be established between the accelerated test and field or service performance.

It is recommended that all suppliers and users of anodized and plated ware take a big step forward and eliminate the use of the Neutral Salt Spray and its false acceptance standards and in its place consider the use of the "Accelerated Salt Spray Test" for product qualification and quality control. Table 4 suggests specifications, which could be established as acceptance standards for various thicknesses of anodizing and plating. There is no doubt that these standards will be refined considerably as the use of this test gains increased acceptance.

Note: Since this article was prepared the "Accelerated Salt Spray Test" has been accepted as standard for General Motors Corp.

Quality

that protects your company's name...

There is no substitute for quality whether you are interested in the components, the workmanship or the end product you manufacture.

One of the basic components of almost every industry is fasteners. Successful operations that cash in on every opportunity for faster assembly utilizing maximum worker output with minimum loss of materials—find that quality fasteners such as Southern Screws form a dependable foundation for profitable production.

Although Southern has earned for itself an enviable reputation for fast service, and its stock of over One Billion fasteners—Quality is the benchmark of Southern products . . . Constant quality that has become synonymous only with U. S. A.-made fasteners produced by U. S. A. workers.

If yours is a quality product, protect your company's name with Southern fasteners. Southern makes every screw it sells.

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New Plating Methods

(*Continued from page* 65)

A method of bright anodizing aluminum alloys has been announced, but here again the finished parts do not have the same color as chromium-plated parts used on the same cars.

Meanwhile, technicians in the electroplating industry have been working closely with the automobile makers in investigating new processes and in developing new solutions and methods for plating the standard metals.

Among the most promising developments is the recent announcement of a method for plating bright crack-free chromium.

Bright crack-free chromium plating over the usual undercoats has proved highly satisfactory in recent tests, and one division of a leading automobile manufacturing company is currently examining and evaluating this type of plating on a portion of its production.

Deposition of crack-free chromium plating is a recent development, and the added advantage of bright crack-free plating is even more recent.

It is generally known that in ordinary chromium plating over undercoatings of copper and nickel, corrosion resistance increases with the thickness of the chromium plate until about 20 millionths of an inch have been deposited. As thicknesses go above that, the plate develops minute cracks. Because of the excellent adhesion of the chromium to the undercoating, when these cracks occur the undercoating itself may crack, too, and the basis metal be exposed to corrosion.

With crack-free chromium plating, the corrosion resistance increases steadily with the thickness of the plate until the optimum of 100 millionths of an inch is obtained. Absence of cracks in the plate accounts for this characteristic.

With perfection of the method of bright deposition of crack-free chromium, one of the main problems in the plating industry appears to have been solved.

Bright crack-free chromium plating does not require the use of additional equipment. Standard plating equipment has been found satisfactory; the only difference is in the plating solution used.

The bright crack-free deposit can be applied directly on the usual basis metals such as stainless steel, copper and brass, and over intermediate coatings to ordinary steel.

Ordinary chromium is honeycombed with corrosion-admitting cracks. Corrosives quickly permeate these deposits, frequently penetrating right down to the basis metal. The crack-free deposit is continuous and is the first chromium deposit to of itself afford a degree of corrosion protection.

The covering power of the bright crack-free solution is excellent and the usual racking facilities have been found adequate in its use.

WAUSAU
Alloy No. 7
HARD
valve seat inserts
WAUSAU ALLOY NO. 7 is an alloyed cast iron produced by the electric furnace method, with a hardness of Rockwell C 50-60. This unusual hardness resists mechanical pounding at high temperatures. The material is corrosion and erosion resistant and distortion and cracking are eliminated by a special process. Alloy No. 7 seats are ideally suited for a wide range of applications where moderately heavy duty performance and low cost are factors. Call or write
WAUSAU MOTOR PARTS COMPANY
Manufacturers
2300 Eau Claire St., Schofield, Wisc.

While these developments have been going forward in the plating of parts for automobiles, progress has also been made in developing plating corrosion tests which give unequivocal findings which can be duplicated at will.

These tests include the acetic acid salt spray test, the accelerated acetic acid salt spray test and the Corrodkote test.

The acetic acid salt spray test is a modification of the salt spray test formerly used, with acetic acid added to maintain the pH of the salt solution at 3.2 to 3.5, to repreduce more accurately the type of corrosion encountered in outdoor service.

The accelerated acetic acid salt spray test, which has the same effect on plated material but in a far shorter time, utilizes the same ingredients as the regular test, with a copper salt added to speed up the reaction.

The Corrodkote test, which was developed under Research project No. 15 of the American Electroplating Society, is designed to produce the effects on car parts of having been splattered with slush after snow has been melted with salt and then being placed in a closed warm garage with high humidity. The test consists of rubbing the cleaned part with a mixture of Kaolin and a suitable chemical mixture to promote corrosion and placing it in a humidity cabinet at 100°F with humidity of about 90 per cent.

The mixtures usually used in the test are based on findings of tests made of conditions in Detroit, where rainfall, slush and snow contain all of the common acids and a great variety of salts of metals, including iron and copper.

These tests have been so devised that they can be reproduced again and again, thereby giving standardized results on identically plated parts and offering reliable findings throughout the range of corrosion resistance.

With these advances in the plating field, and the continuing research being carried on by automobile manufacturers and plating material suppliers, indications are that better, longer-lasting plating can now be achieved.

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FIRST
IN RINGS FOR
AUTOMATIC
TRANSMISSIONS
P N D L R
Oldest manufacturer of sealing rings in the industry WAUSAU was first to produce rings for automatic transmissions, power steering and many other automotive and industrial applications.
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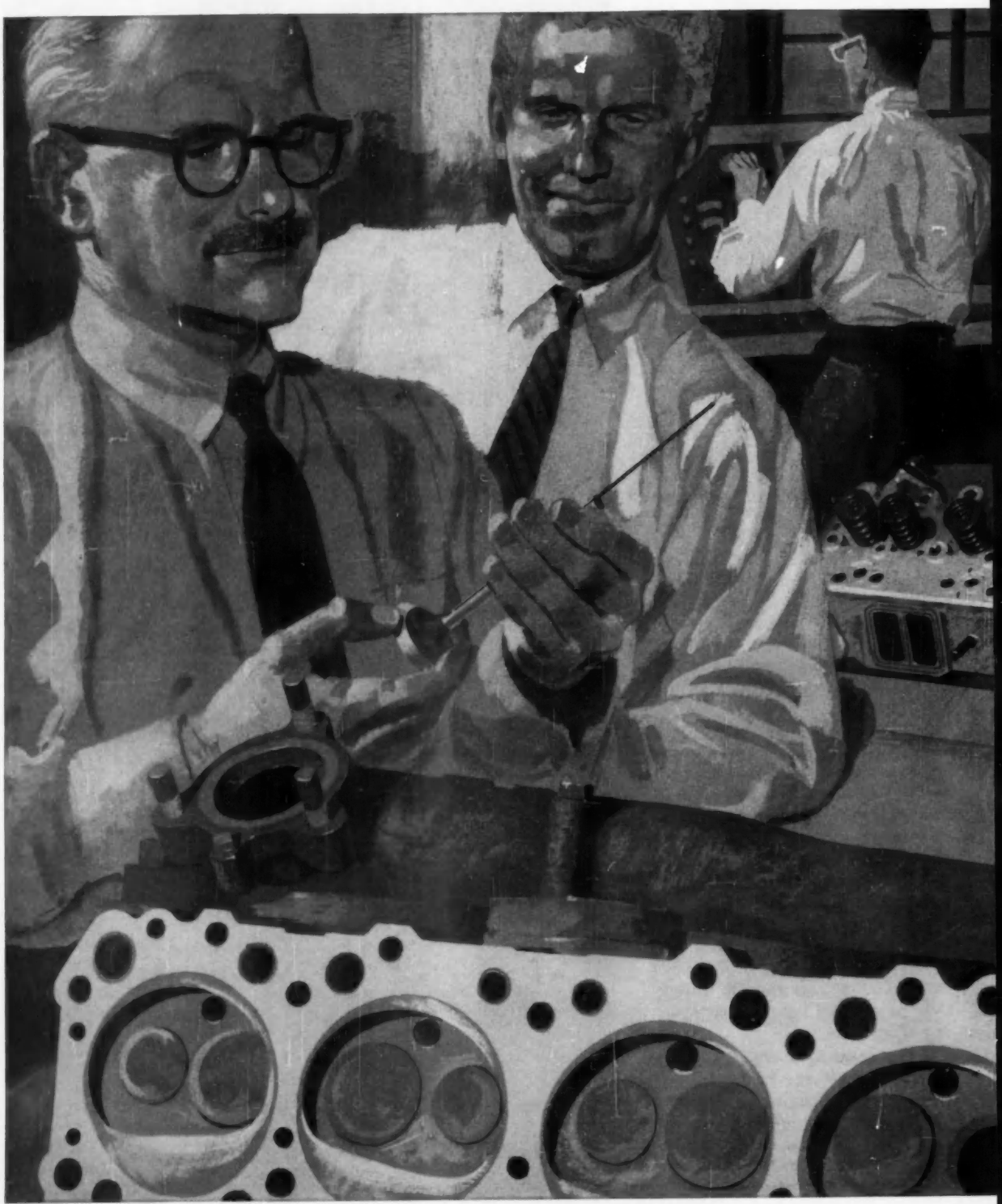
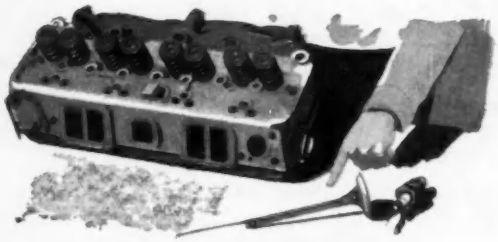
"We boosted exhaust valve life



four times with aluminum heads!"

Tests run in the Alcoa Development Division Laboratories on production engines prove the advantages of aluminum heads. In one test, to determine exhaust valve temperatures accurately, Alcoa engineers actually buried thermocouples in the valve heads. In the aluminum head, exhaust valves ran an average of 100°F cooler at 3,000 rpm and 125°F cooler at 4,000 rpm than in an iron head of identical design and compression ratio. Actual production experience has proved that the cooler running valves in the aluminum head lasted four times longer.



Test valve with thermocouple in place.

Savings in gasoline

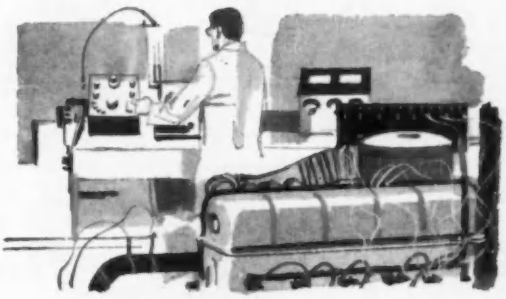
The cast iron head required fuel up to four octane numbers higher than the aluminum head. Refiners must spend millions to raise octane numbers just one point. This benefit of aluminum heads helps keep automobile operating costs down.

Savings in weight

The weight of the aluminum head in the Alcoa Development Division tests was only 40 per cent that of the cast iron head of similar design. Using aluminum heads, this saving in weight on the front end helps in correcting mal-distribution of vehicle weight, thus improving roadability and handling. With a lighter engine, there can also be a corresponding reduction in the size, weight and cost of supporting members such as suspension parts and engine mounts.

Surface ignition

As compression ratios go up in modern engines, surface ignition becomes more of a problem. It may be caused by a hot plug tip, exhaust valve or glowing piece of carbon in the combustion chamber. Aluminum heads help relieve the surface ignition problem through superior head dissipation.



Aluminum heads were run hundreds of hours in the Alcoa Laboratory.

No hot spots

Heat is more evenly distributed throughout an aluminum head. Efficient cooling is obtained in critical locations. Hot spots are eliminated. This results in lower levels of thermal distortion and a reduction in the tendency to distort. Reduced temperature ranges facilitate matching the right spark plug to the engine. Also, there is better conduction of heat away from the plugs.

Let Alcoa help

You are probably doing development work on aluminum heads right now. Alcoa, the most experienced aluminum producer in the industry, stands ready to offer the facilities of its laboratories and the knowledge of its engineers to manufacturers working on this or any other aluminum application. Let us work with you. Write Aluminum Company of America, 1841-M Alcoa Bldg., Pittsburgh 19, Pennsylvania.

NEW! "ALCOA THEATRE"
Exciting Adventure, Alternate Monday Evenings

ALCOA ALUMINUM gives every car more **GLEAM AND GO**

SAE Holds Three Meetings

(*Continued from page* 68)

the further improvement of acceleration and power response of still higher specific output turbocharged engines.

M. W. Paquette of the P & H Diesel Engine Div. of Harnischfeger Corp. outlined some of the engineering details of the line of uniflow-scavanged, two-stroke Diesel engines produced by his company. A distinctive feature of the line is the employment of aluminum in a variety of parts including cylinder blocks, pistons, oil pans, valve covers, water manifolds, flywheel housing, and other parts. Accessibility has been given such careful attention that major elements such as cylinder heads, liners, pistons, connecting rod-bearings, etc., can be replaced in a minimum of time.

"Fumigation," a technique of introducing a portion of the fuel charge of a Diesel engine into the intake manifold in the form of a fine mist, was investigated by Alperstein, Swim, and P. H. Schweitzer of the Pennsylvania State University. Laboratory tests resulted in smoke reductions up to 80 per cent; increase in smoke-limited power output to 18.5 per cent; shorter ignition lag; and decrease in specific fuel consumption up to 9.8 per cent. For a good grade Diesel fuel about 15 per cent of the main fuel supply was found to be adequate for fumigation. Maximum benefits accrue when inducting fuel in the form of a very fine mist, not over four-microns. This is done by means of an experimental apparatus called Micro-Fog.

In the present state of development this device appears to be best adaptable to large Diesel engines, although the authors recommend it for Diesel trucks. In its present form the atomizing device requires considerable air pressure. However, the authors say that the standard air compressor used in motor trucks should be adequate for supplying air to the pneumatic spray nozzle in the intake manifold.

Here are some of the conclusions reached by D. L. Powell and H. R. Barton of the Armour Research Foundation in their investigation of the dynamic loadings of automotive hypoid gears: with heavily loaded trucks, the climbing of steep grades can increase ring gear torque as much as 13 to 24 times that of level road load under steady speeds; the highest gear loads produced in cars and trucks under normal operating conditions occur as a result of gear shifting; engine misfiring resulting from spark plug fouling causes repetitive gear loading equal to the 60-mph drive side shock in the CRC L-19 test; shocks such as those imposed in the VV-L-761 shock test or in gear shifting of heavily loaded trucks on steep grades produce severe lubrication requirements by imposing large stepwise changes of loading on a contact

BIG

HARDENED & GROUND PARTS?

Look at the work WE HANDLE!

Here is an intricately formed tapered pin for off-road equipment. It weighs 40 pounds. Starting with heat treated 4" bar stock, three different tapers are turned, with all diameters ground concentric. Ends are hob-threaded, and one end drilled and tapped. Final operation is the cadmium plating of bottom taper.

Mass production of such difficult parts as this is our specialty. Behind it is 40 year's experience in metallurgical engineering, precision grinding and uniform quality control.

For information, send a wire, letter or print. We'd welcome one of your toughest problems.

Henry W. Brown
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Experienced production on: King Pins • Wheel Studs Shackle Bolts • Shackle Pins • Brake Anchor Bolts Countershafts • Idler Shafts • Stub Axle Shafts • Steering Ball Bolts • 5th-Wheel Rocker Shafts • Water Pump Shafts . . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

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Each of these billets represents hundreds of hours of research, developing new concepts for efficient heating of copper, brass, aluminum, steel, titanium, and other metals by induction heating.

Research and over 70,000 KW's of Magnethermic installations give us the experience to design the proper induction heating equipment for hardening, brazing, heat treating, forging, extrusion.

Are you considering an induction heating application? We can give you an unbiased recommendation on the best frequency for your work, including material handling equipment tailored to your production line. Write Magnethermic for prompt, specialized attention.

Induction Heating Equipment 60 to 450,000 cycles

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Whether you need a single, standard polishing head or a specially engineered, fully automatic production line with all the trimmings, Murray-Way can do the job better, more reliably, for greater operating efficiency.
You are invited to consult our engineering staff about your finishing problems.
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P. O. BOX 180, MAPLE ROAD EAST BIRMINGHAM, MICH.
Polishing, Buffing, Grinding, Filtering Equipment
that automatically cuts your costs.

point in one revolution of the pinion.

A method of predicting the oil consumption characteristics of oils in normal passenger car service was described in a paper by J. K. Patterson and R. C. Gregor of Esso Research and Engineering Co. Field test results have shown that the oil consumption characteristics of a wide variety of oils can be predicted for a typical car population from the equilibrium used oil viscosity measured at 210°F. The method is suitable for predicting the consumption characteristics of finished oils of widely differing viscosity indices and different types of VI improvers.

• • •

OBSERVATIONS

(*Continued from page* 100)

automotive industries. It is in process right now. It is the answer to the machine tool builders who have started worrying about shrinking order boards.

Plastic Bodies

Interesting indeed is the news from Chevrolet that the Corvette will continue with the use of plastic body sections. It is important to note one major refinement in practice. For 1958 something like 27 different sections will employ aluminum reinforcements, molded into the plastic sections. These are used at heavily loaded points where fastenings are required.

Economy Trend

Faint whisperings are being heard of fuel economy in the midst of a season of still bigger engines. Oldsmobile was the first one this season to mention economy. The Olds 88 with its two-barrel carburetor is specifically designed for high fuel economy by restricting engine output at the upper corner of the power curve. A little later, Chevrolet announced that in 1957 about 38 per cent of car production was equipped with the economical 6-cylinder engine.

CLECO

MULTIPLE SPINDLE UNITS

for modern assembly lines

✓ **reduce costs**

✓ **facilitate quality control**

✓ **speed production**

If "one-at-a-time" rundown of nuts and bolts on your assembly line results in labor costs higher than you like to think about . . .

If your production schedules would benefit from increased speed and efficiency in multiple nut setting, bolt tightening, or similar operations . . .

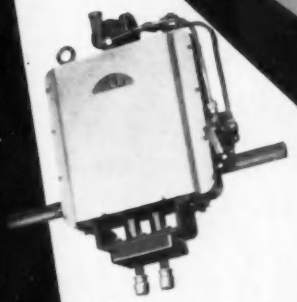
If your product needs the quality control afforded by the simultaneous application of uniform torque to all nuts or bolts . . .

Why not call on Cleco, pioneer developers of modern, pneumatically powered multiple spindle assembly equipment?

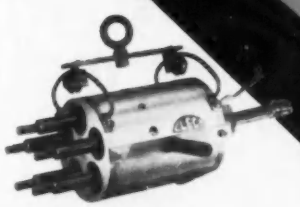
Cleco will custom engineer a multiple spindle unit for your specific application, whether you require a manually-controlled, semi-automatic, or automatic machine—whether your operation calls for 2 driving spindles or 24, or more.

Motor arrangement patterns are practically unlimited. The use of standard, proven Cleco Air Motors assures uniform operating efficiency, low maintenance costs, and immediate parts availability.

Illustrated are a few examples of the many custom-designed multiples Cleco has delivered. To get detailed information about what Cleco can do to speed production, improve quality control, and cut down costs for you, write Cleco Air Tools, P. O. Box 2119, Houston.

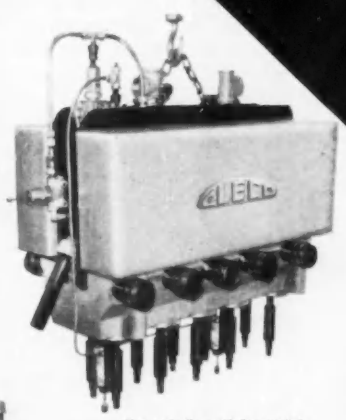


Two spindle nutsetter for automobile stabilizer bracket assembly.

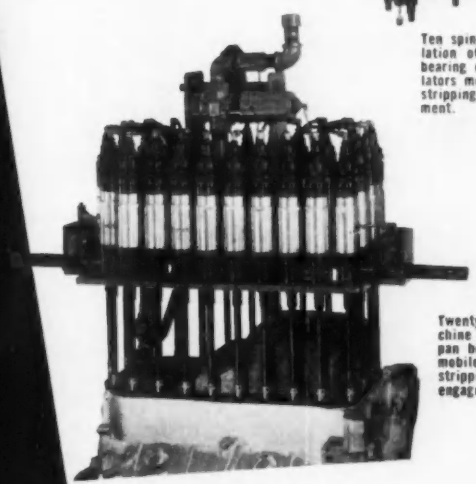


Five spindle unit for wheel assembly.

Six spindle nutsetter for assembly of flywheel to crankshaft. Close center distance made possible by driving spindles through offset gears. Unit has stripping rod for easy disengagement from the work.



Ten spindle unit for installation of V-8 engine main bearing caps. Has air regulators mounted in manifold, stripping rod for disengagement.



Twenty-four spindle machine shown setting oil pan bolts on V-8 automobile engine. Has stripping rods for disengagement.

CLECO
AIR TOOLS

Division of Reed Roller Bit Company
HOUSTON

1958 Engines Offer Wide Variety of Induction Systems

(*Continued from page* 60)

cases, combustion chamber cavities have been removed from the cylinder head. The cylinder head is machined to a smooth plane. Similarly, the bank faces of the cylinder block are machined smoothly and are inclined with respect to the axis of the cylinder bore. The inclination ranges from 10-deg on one make to 16-deg on another, to provide for the desired wedge-shaped combustion chamber when the piston is at top dead center. On these engines the piston has a stepped head to provide the necessary squish area for controlling detonation and providing for turbulence.

These engines can now claim a completely machined combustion chamber. On the other hand, some other makes have redesigned the more conventional combustion chamber configuration to make it possible to machine the combustion chambers in the head. These devices all are effective in producing combustion chambers of uniform volume, free from surface roughness, all conducive to free movement of the compressed mixture and promising less formation of hot spots and deposits.

It is interesting to note that Chrysler Corp. is gradually eliminating engines with two rocker shafts per head in favor of single rocker shafts.

Fuel injection is beginning to shake down to its proper place in the picture. The promotion phase is out of the way and some of the leading producers now are turning their attention to the design refinements leading to improved low speed and idle performance. Eventually, means must be found for reducing manufacturing costs sufficiently to make the system practical for general installation.

At this writing, Chrysler Corp. is offering the Bendix electronic system in all selected models of every line. Chevrolet offers the RPD system only on the Corvette engine. Pontiac offers the RPD system too. However, none of the Ford Motor Co. divisions nor the other General Motors divisions supply fuel injection at this writing.

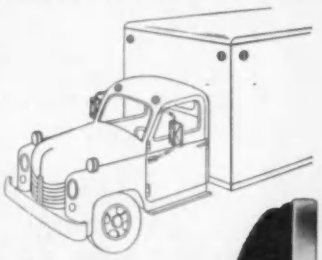
Fuel injection has many potential advantages, not the least of which are—a gain in fuel economy and a gain in engine output. Except on "hot" cars, these advantages do not appear to compensate for the higher cost of installation on conventional motor cars. And this is something that will have to be resolved by the major producers in time. One must not overlook the possibility that fuel injection one day in the not-too-distant future may become a major factor in the induction systems of passenger cars.

Although this discussion is devoted exclusively to passenger car engines, we do want to inject the thought that fuel injection could

for greater safety

unique twist-off lens on K-D's new marker lite

Flush-mounted new KD 525 Clearance, Marker or Cab Lite requires no tools to remove lens for bulb change. No screws or retaining rings to lose. *Depth less than one inch!* Diameter 2⅛". Patent pending for the unique twist-off design. Acrylic plastic lens engineered for light output far exceeding SAE requirements . . . full 180° light distribution. Rigidly supported 2 cp bulb with perfect contact assured by heavy spring bronze contact. Neoprene closed cell gasket seals light from moisture and dust. Superior Lexide mounting pad. All aluminum high gloss finish housing. Absolutely rustproof throughout. Simple to mount . . . ⅛" hole to drill for wire . . . two holes for sheet metal screws. KD 525 is an ideal compact lite . . . easy to mount, easy to change bulb . . . a quality product for long life.



KD 525

KD 525

other unique clearance marker lites

KD 524-1

Both KD 524-1 Armored Lite and KD 524 Clearance Marker Lite have the same unique twist-off design lens as KD 525 to assure easy bulb change without tools, screws or retaining rings.

KD 524

The Complete Line These Clearance Marker Lites are indicative of K-D's valuable single-source-service of all automotive Saftee Products.

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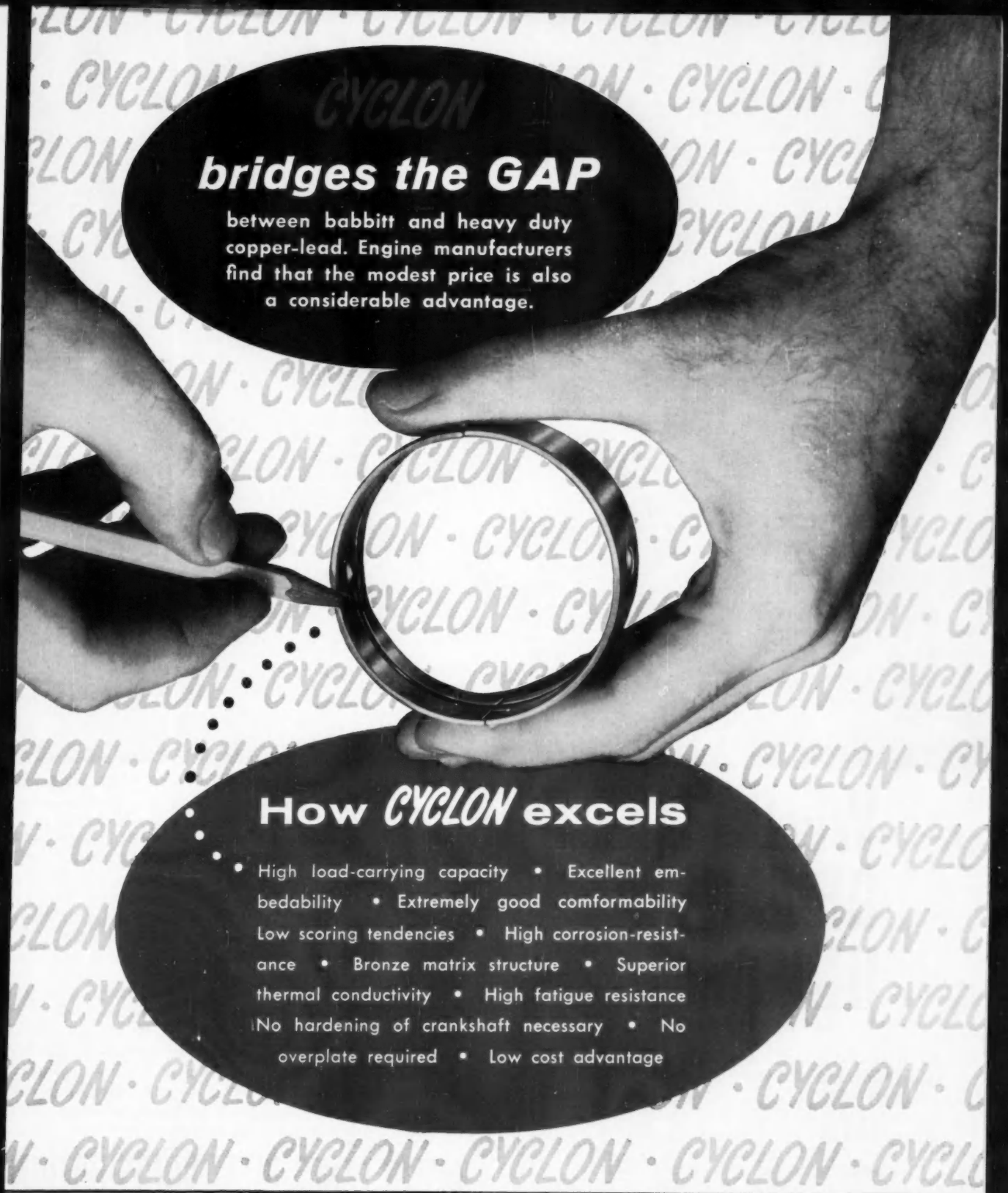
THE COMPLETE LINE • SAFTEE PRODUCTS


bridges the GAP
between babbitt and heavy duty copper-lead. Engine manufacturers find that the modest price is also a considerable advantage.
How CYCLON excels
• High load-carrying capacity • Excellent embedability • Extremely good comformability Low scoring tendencies • High corrosion-resistance • Bronze matrix structure • Superior thermal conductivity • High fatigue resistance No hardening of crankshaft necessary • No overplate required • Low cost advantage

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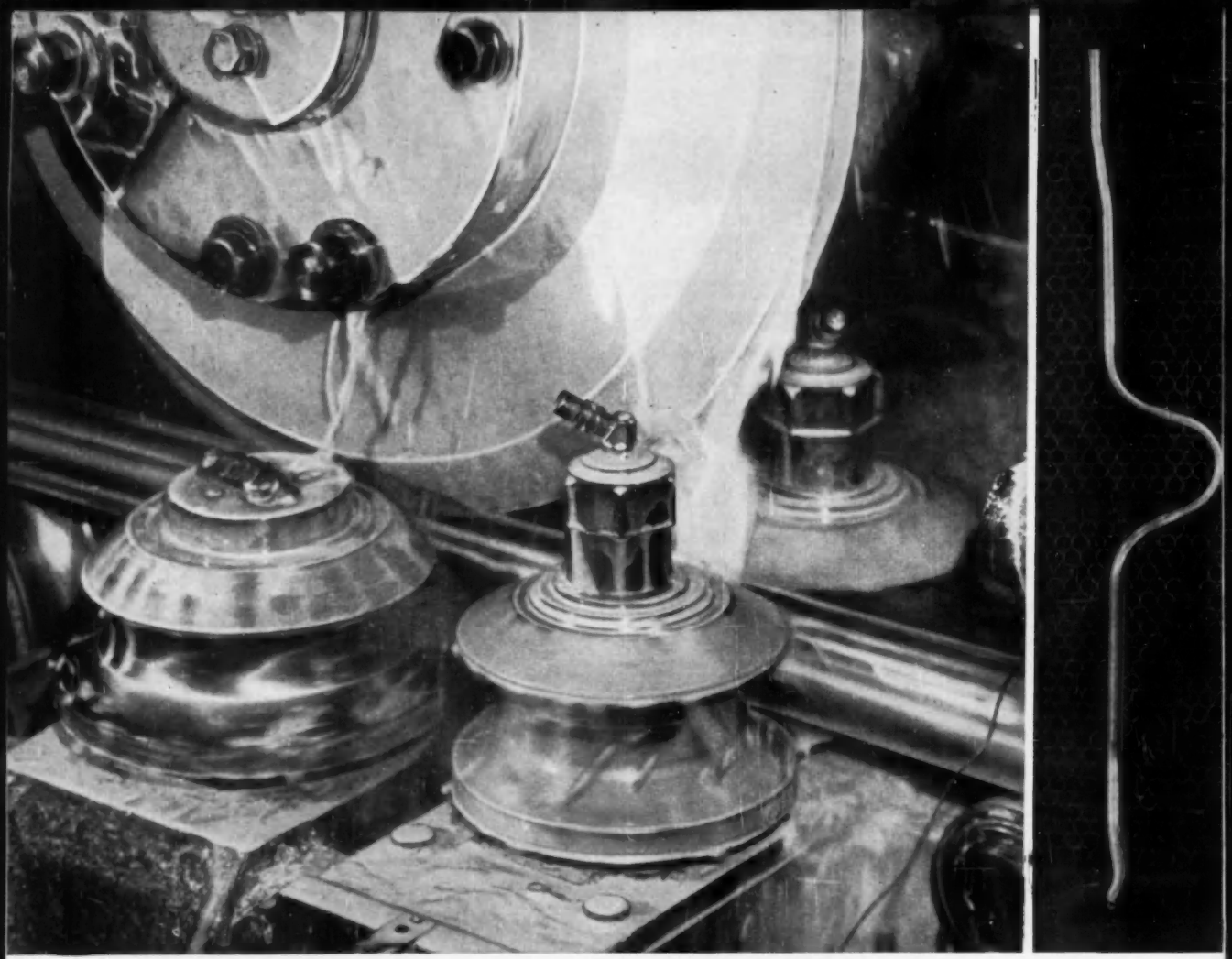
MANUFACTURERS OF ORIGINAL EQUIPMENT SINCE 1925



WELDS LIKE THIS DEMAND A UNIFORM STEEL

Tailpipe is butt-welded (left) in a continuous seam at the rate of 150 feet per minute as it travels through a tube mill. Finished passenger car tailpipe (right) is then bent from the welded tube stock.

Automatic high-speed welding techniques, common in many industries, can work to maximum efficiency only when the steel is quality-controlled to give the best welding characteristics. Great Lakes Steel has had long experience in satisfying the exacting needs of a wide variety of customers in this respect.

Great Lakes quality-controlled steel has the uniformity of grain structure, surface and thickness that facilitate high-production welding.

But uniformity is only one of the important characteristics of Great Lakes steel. Others, such as strength and ductility, combine to bring to you dependable performance during fabrication and in the end product.

When you get Great Lakes steel you get steel that fits your specifications, delivered on time. For the full story of Great Lakes quality-controlled steel, make it a point to call your Great Lakes Steel representative soon. He's as near to you as your telephone.

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District Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Grand Rapids, Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Toronto.

be a valuable factor in heavy duty truck engines right now. Needless to say, the heavy duty over-the-road vehicle operators are extremely sensitive to fuel economy since that is one of the major elements of cost in their operation. A saving of 10 per cent in the fuel bill would pay the cost of a fuel injection system in short order and would then be instrumental in lowering operating costs. Moreover, while an increase of some 10 per cent in horsepower means little to a motor car owner, considering the power available today, it means an important gain to any truck operator. Altogether, a gain in fuel economy coupled with a gain in engine output, means enough to a truck operator to justify the higher cost of fuel injection right now.

One of the major problems with present day high performance engines is concerned with the ignition system. Deposits on, and erosion of spark plug electrodes, creates problems in cold weather starting and high speed firing. Engineers are looking to the development of an alternator system tailored specifically to the needs and cost levels of passenger car engines. Development of an acceptable system should mark another gain in the course of high performance passenger car engines.

Finally, a word about the possibilities of an all-aluminum engine. There are many problems involved. Yet it is significant that the strictly design problems are no longer a bar to a shift to aluminum. The big problem is one of the cost involved in making the big molds and the investment that will be entailed in building the huge die casting machines that are required. Undoubtedly, these problems are being studied by some of the large companies involved in this new development.

AUTOMOTIVE INDUSTRIES . . .

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MANUFACTURING

There's a real POINT in using...

SCHRILLO

SINGLE-LIPPED COUNTERSINKS

Never before has there been a tool like the SCHRILLO SINGLE-LIPPED COUNTERSINK. Its smooth chatterless operation in even the toughest alloy steels makes it indispensable for efficient countersinking and external deburring applications. The cutting edge and rigid radial relief control are correctly designed for fast, clean cutting.

Produced of specially selected High Speed Steel and heat treated in our own plant to assure uniform hardness, this exclusive SCHRILLO tool comes in 7 body diameters, each in your choice of standard 60, 78, 82, 90, 100, 110 or 120 degree angulations.

This is another in the great family of quality products made exclusively for the tooling and gaging industry by SCHRILLO.

TOOL NO.	SIZE	SHANK	PRICE
3108	¼"	3/16"	$2.05
3112	3/8"	¼"	$2.40
3116	½"	¼"	$2.95
3120	5/8"	¼"	$3.85
3124	¾"	¼"	$4.35
3128	7/8"	¼"	$5.25
3132	1"	¼"	$6.35

(When ordering, specify angulation.)

SCHRILLO

AERO TOOL ENGINEERING COMPANY

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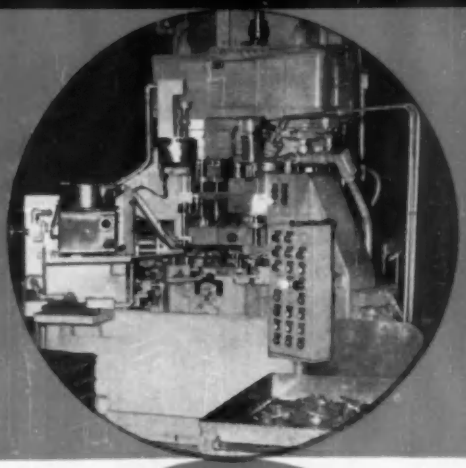
WRITE TODAY FOR FOLDER NO. 1018 AND NAME OF DEALER NEAREST YOU



Two sizes of motor end-plates are assembled, bored, drilled and tapped in a Natco 3-Way Machine.

At Wagner Electric Corporation

One Natco

NATCO

Assembles, Bores, Drills and Taps... Reduces Labor Cost 70% On Small Motor End-Plates

This Natco combination assembly and multi-drilling machine presses a bearing sleeve into the end-plate, rough and finish bores the outside bearing-cap hole, drills an oiler hole at an angle, drills four (4) thru-bolt holes, and drills and taps two (2) 8x32 cover plate holes. *Production is 170 pieces per hour.*

This Natco accommodates two sizes of motor end-plates without changes in the basic rotary-table tooling. In addition to this important versatility the engineers at Wagner Electric point out these other advantages:

- *one operator* controls the assembly and machining from one station.
- *work scheduling* is simplified due to the short machine cycle.
- *in-process inventory* can be kept at a minimum because of high production rate.
- *floor space* is made available for other operations.

Natcos perform all kinds of drilling, boring, facing and tapping jobs in every conceivable combination and sequence.

Ask the Natco Field Engineer about the newly perfected tape control systems for Natco production tools.

National Automatic Tool Company, Inc.

Richmond, Indiana *Multi-spindle drilling, boring and tapping machines. Special machines for automatic production.*
Call Natco Offices in Chicago, Detroit, New York, Buffalo, Philadelphia, Cleveland, Los Angeles; distributors in other cities.

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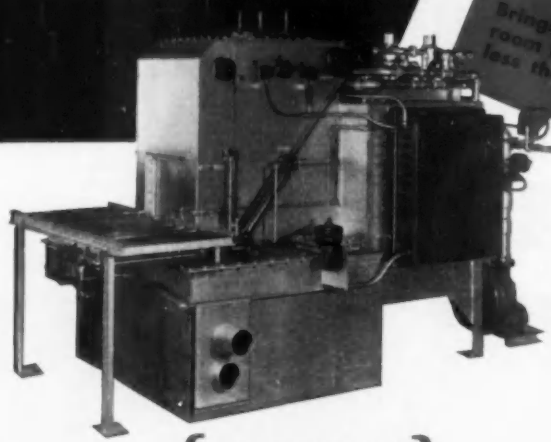
Sealed Cycle
CONTROLLED ATMOSPHERE BATCH-TYPE FURNACES

Model J-800
Brings 800 lb. load, room temp. to 1500°F. less than 1 hr.

Model HA-400
Brings 400 lb. load, room temp. to 1500°F. less than 1 hr.

Model HB-200
Brings 200 lb. load, room temp. to 1500°F. less than 1 hr.



Model HA-400 Shown

THE RIGHT { CAPACITY / PRICE / PROCESS } FOR YOUR JOB!

Regardless of capacity, price or degree of mechanized operation you may require, each of these furnaces has DOW'S exclusive built-in generator and other outstanding DOW features that insure high quality work at lowest cost.

Every DOW furnace is designed with controlled furnace pressurizing, controlled quench oil circulation, and controlled atmosphere circulation . . . all proven advantages that mean cleaner stock . . . uniform hardness . . . minimum distortion.

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First WITH MECHANIZED, BATCH-TYPE, CONTROLLED ATMOSPHERE FURNACES

Aircraft Hydraulics Conference

(*Continued from page* 69)

20 in. long, and has a motor diameter of less than four inches. It was brought out that the oilcooled unit is smaller and lighter than aircooled units of comparable rating and has the additional advantage of eliminating the duct work in the airframe normally required for cooling the electric motor.

Another new device is the "spacemaster" servo valve. It is a two-stage, light weight, electro-hydraulic servo valve about 30 per cent lighter than competitive valves. It is intended for missiles and aircraft.

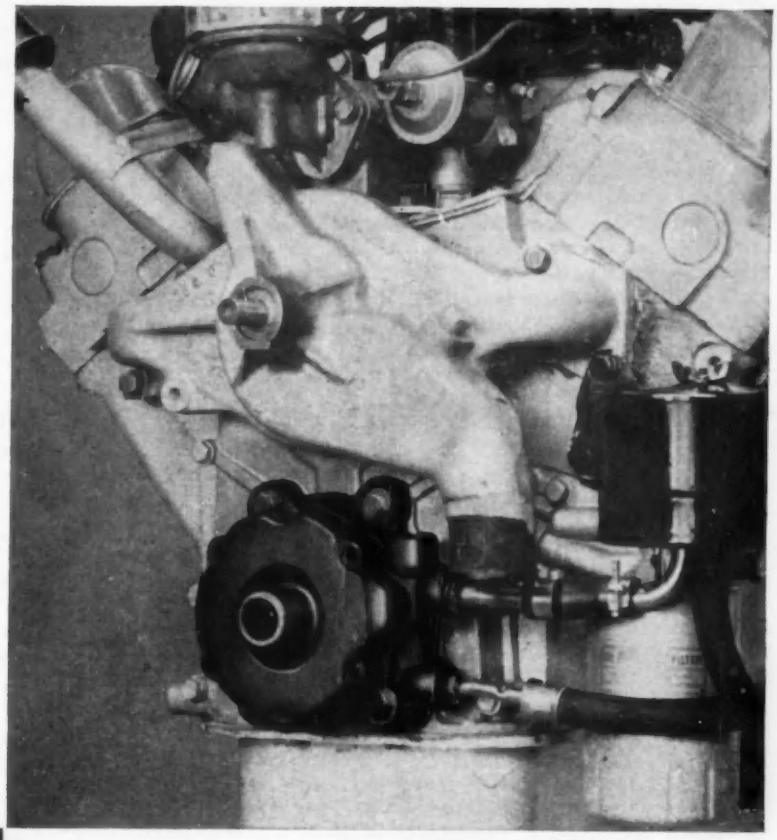
High temperature hydraulic actuators too are new in the Vickers line. Some aircraft and missile applications now call for operation at 1000 F. Depending upon the temperature range, Vickers employs either titanium or a combination of titanium and high strength stainless steel in these components.

The miniature vane pump is a device that has been developed primarily for missiles applications where fluid pressures are below 1000 psi but require high speeds and relatively low displacement. The pump for such service delivers one-gpm at 9300 rpm and 1000 psi. It is small and light weight, simple and inexpensive to produce. Vickers pointed out that it has a background of some 25 years in building vane pumps, one of its most successful applications being for automotive power steering. Certainly it is noteworthy that the company has produced over 4.5 million vane pumps, for this purpose, in the past six years.

In a summary of what hydraulics can do, Frank L. Moncher, of Vickers, outlined numerous current applications, touched on the use of hydraulics in the expanding missiles field. The necessity for high performance and reliability coupled with tight space restrictions dictates the use of hydraulic muscles. A typical packaged system supplies hydraulic power for flight controls and includes an accumulator, reservoir, fuel tank pressurization, and the necessary controls. Other applica-

saving
accessory
space

on the 1958
Mercury



new VICKERS
direct crankshaft-driven power steering pump

Designed to be an integral part of the engine, this Vickers advanced design power steering pump mounts on the engine front cover for direct crankshaft drive. Elimination of mounting bracket and V-belt drive saves vital engine compartment space and simplifies power transmission problems. The direct crankshaft drive also assures power for steering under all conditions.

This new pump, incorporating time tested Vickers features, is a result of coordinated teamwork between automotive manufacturer and supplier . . . the kind of teamwork that builds great products.

VICKERS INCORPORATED
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MORE VICKERS TYPE VANE PUMPS than all other makes combined are used for HYDRAULIC POWER STEERING

7972

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

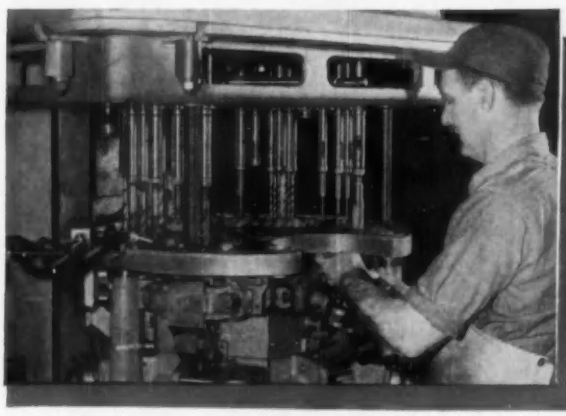
tions include small alternator drives, nozzle actuation, fan, and pump drives for cooling electronic equipment. A major application is in the actuators for the propellent valves on liquid propelled rockets.

A paper dealing with optimization through a load-sensitive (variable pressure) system listed its advantages as follows: high power transfer efficiency, high power levels, savings in component size, ability to handle more than one load from a single pump, accuracy of control, and increased safety margins.

Another report dealt with the advantages of optimizing the hydraulic system through high temperature compatibility. While a good case is made for optimizing the newer Type III hydraulic systems, the company cautions that this approach must be carefully weighed for specific applications. For example, in a 550 F environment any advantage an uncooled system might have enjoyed, over a cooled system, will have disappeared. Moreover, when compartment temperatures exceed 600 F, the employment of artificial thermal environments may be the only way in which any system using present day materials may be made to perform its function.

HOW SEIBERT SPINDLES HELP SUNDSTRAND

BUILD BETTER PUMPS



★ For 4 years, Seibert Multiple Drill Spindles have been helping maintain close tolerance standards at the Hydraulic Division of the Sundstrand Machine Tool Co., Rockford, Illinois. Multiple spindle drilling machines, as shown in the photo above, are equipped with 32 Seibert Slip Spindles and Adapters of varying sizes, for drilling, reaming, chamfering, and spot facing cast iron Fuel Unit Pump Bodies. Tolerances are held to within .002" of basic location, at spindle speeds ranging from 805 to 2760 R.P.M.

Investigate today, the three advantages of standardizing with Seibert production holding tools. You will find they will meet your most exacting tolerance requirements because they are precision built . . . you save money too, for Seibert holding tools are lot produced in a wide range of standard sizes . . . and your orders receive prompt, efficient handling because Seibert specializes in the manufacture of production holding tools only.

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Write for Folio 1-50 illustrating and describing the complete line of Seibert Multiple Drill Spindles.

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Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

Practical Method for Removing Oxides from Molybdenum

(*Continued from page* 53)

posed of 15 per cent sulfuric acid, 15 per cent hydrochloric acid, 70 per cent water plus six to 10 per cent weight/volume of chromic acid. The solution is kept at ambient temperature with immersion time set at five to 10 minutes. The bath is adequate if the oxide is completely converted by the caustic bath.

Ryan chemists have found the baths to be satisfactory for deoxidizing prior to fusion welding and believe them to be applicable wherever deoxidizing is required in the fabrication of molybdenum.

Molybdenum is also used extensively in sheet form as the plate elements in vacuum tubes, and in wire form as heating elements for electric resistance furnaces. Because of the unusual physical properties of molybdenum, the pure metal is used for many new applications. Included among these are its use in high temperature components for gas turbines, ramjets and rockets. High strength at elevated temperatures is one of molybdenum's desirable properties.

Molybdenum has a low thermal neutron absorption cross section i.e., 2.4 barns. This factor, combined with its ability to withstand temperatures above 1600 degrees F, may qualify it as a new material for construction of nuclear reactors.

The physical-mechanical properties of molybdenum are, as with most metals, dependent upon its past history. Augmenting these properties can be obtained only by mechanical working. At room temperature in the recrystallized or annealed condition, molybdenum's

you can meet any lubrication specification if you

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(VISCOSITY-INDEX IMPROVERS)

Base stocks blended with Enjay Paratone can be compounded into lubricants combining cold-weather quick starting properties with high temperature, low consumption characteristics. These lubricants are *all-season* oils, featuring improved gas mileage. More and more refiners and blenders are relying exclusively on Paratone to produce the high "VI" required in these all-season oils.

Through years of intensive research and development work with automotive manufacturers, Enjay has developed the only *complete line* of high quality additives (Paramins®) that can assure *maximum* performance characteristics. Why not let this experience and know-how work for *you*? Write, wire or phone the Enjay Company today.

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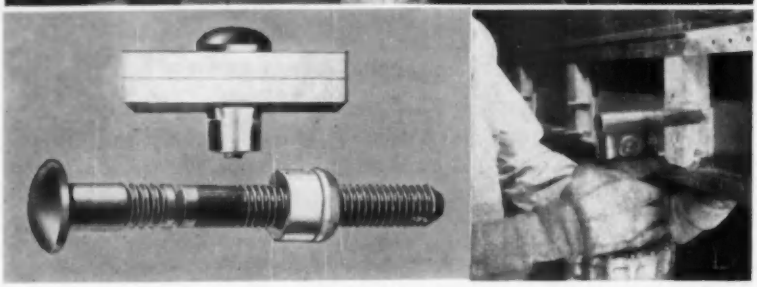

Townsend Lockbolts Provide Strong, Vibration-Proof Joints For Rugged Fruehauf Volume ★ Vans

Rugged, high-payload Volume ★ Vans are built using Townsend lockbolts† at critical points to provide the utmost strength. "Fruehauf uses lockbolts because they result in a uniform, high-strength, vibration-proof joint without need of skilled operators," says George Chieger, Executive Engineer.

Townsend lockbolts are easy to apply. The gun engages the pull grooves of the lockbolt. As the trigger is depressed, the work is drawn together with a high clinching action and the collar is swaged into the locking grooves of the pin, forming a permanent lock. The lockbolt pintail then is broken off at the breakneck groove, and ejected from the gun automatically. The entire operation is fast, and requires no special training or skill.

Lockbolts also have advantages in service work, says H. J. Biers, Fruehauf General Service Manager, "When field repairs are required that necessitate removal of lockbolts, they always are replaced with comparable lockbolts. If a better fastener were available, Fruehauf would use it."

For a complete explanation of how Townsend lockbolts can help you to obtain stronger, longer-lasting joints, allow us to send one of our representatives. He can give you a complete demonstration right at your desk. Townsend Company, P.O. Box 237-CC, New Brighton, Pa.

†Licensed under Huck patents RE 22,792; 2,114,493; 2,527,307; 2,531,048; 2,531,049 and 2,754,703

THE FASTENING AUTHORITY

Townsend

COMPANY • ESTABLISHED 1816

NEW BRIGHTON, PENNSYLVANIA

Sales Offices in Principal Cities

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strength, hardness and bend ductility are low, while its tensile elongation is better than in any other condition.

By "working"; i.e., rolling or forging the metal just below the recrystallization temperature, the tensile strength, hardness and bend ductility are increased. This is commonly referred to as the ""worked" or "work-hardened" condition. It has been found that worked molybdenum, with a minimum of 60 percent reduction of area by warm working, gives optimum ductility. Therefore, by leaving molybdenum in the worked condition or by annealing it, the desired mechanical properties can be obtained within the basic limits of the metal.

Due to its high melting temperature of 4730 degrees F, molybdenum is much "colder" at room temperature than is steel or aluminum. Some metals exhibit a transition temperature, below which their ductility rapidly diminshes. For the majority of these metals, this transition temperature is below room temperature, but for molybdenum it is about 400 degrees F. Therefore, normal fabricating operations on molybdenum should be done at elevated temperatures.

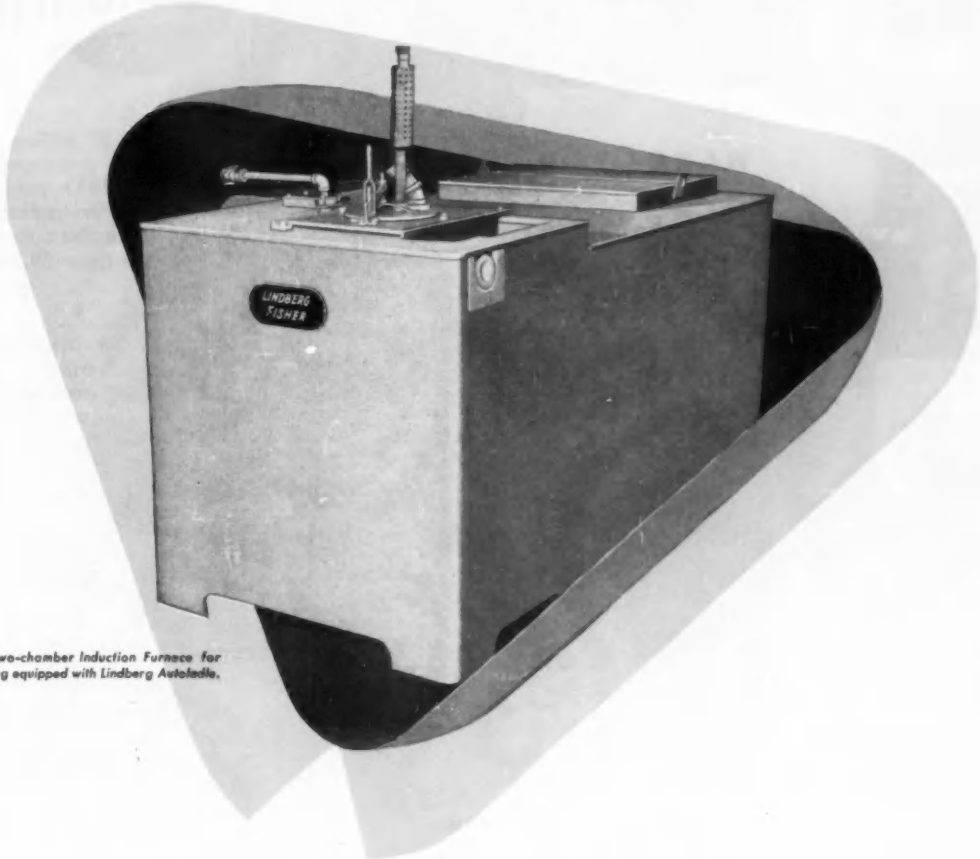
Molybdenum's most valuable physical property is its ability to resist heat without loss of strength. If given surface protection from oxygen, it can be used at temperatures where many alloys and pure metals are molten.

At room temperatures, molybdenum is stable in air or oxygen. However, at temperatures above 930 degrees F, it forms molybdenum trioxide which is volatile dense, white smoke. In practical applications this may soon be overcome by coating the molybdenum with a protective material such as nickel or chromium.

Resistance to molten metals such as lithium, sodium and sodium potassium, which have been proposed as cooling media for nuclear reactors, is also a property attributed to molybdenum.

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

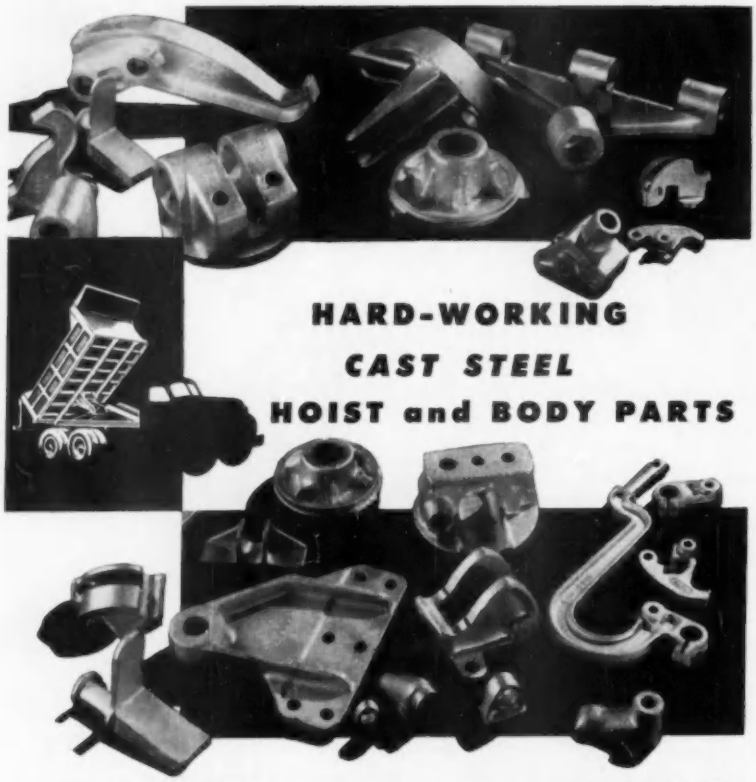
Here's the ideal combination for casting aluminum automatically



Lindberg-Fisher two-chamber Induction Furnace for melting and holding equipped with Lindberg Autoladle.

Do you die-cast aluminum? Then take Lindberg's famous two-chamber induction melting and holding furnace, add "Little Joe" Lindberg's new automatic pump, and you'll have the most efficient automatic combination anywhere. The Lindberg-Fisher two-chamber furnace *melts* in one chamber, *holds* metal at precisely the right temperature in the other chamber, and "Little Joe" automatically delivers exactly the right size shot to the casting machine. With this combination all handling of molten metal is eliminated, perfect control of metal temperatures and shot size is maintained, and all automatically. For safer, more economical, more precise handling of aluminum or any non-ferrous metals or alloys better see Lindberg. Just get in touch with the Lindberg plant or the Lindberg Field Representative in your locality, or write Lindberg-Fisher Division, Lindberg Engineering Company, 2491 West Hubbard St., Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Ave., at Downey, California.

LINDBERG heat for industry



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HOIST and BODY PARTS

...made *BETTER* with UNITCASTINGS!

When heavy-duty truck equipment is subjected to terrific poundings, extremely heavy loads, shocks, and stresses—its durability, ruggedness, and ability to "take it" depends on the quality of the components.

Steel castings are used for many of the "wear" parts in a major manufacturer's line of hoists and bodies because they "stand up" on the job . . . assure the required strength, resistance to wear and corrosion . . . offer good weldability and minimum weight.

"Foundry Engineered" Unitcastings meet the dimensional accuracy, internal soundness, good surface appearance and other requirements specified by the customer. In addition, Unitcast's modern steel casting methods and facilities make possible the *consistent uniformity* that means a *lower end cost!*

Let Unitcast's engineers show you how steel castings will serve you better! Write today for complete information.

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Unitcast

SPECIFICATION STEEL CASTINGS

SHORTIES

More than 37 billion barrels of oil have been produced over the years 1933 to 1955; yet during this same period, the nation's proved reserves have risen from 12 barrels to more than 30 billion barrels.

•

A U. S. jet interceptor plane carried electronic equipment equal in cost and complexity to that used by an average television station.

•

The U. S. produced 1,107,796 trucks and 4206 motor buses in 1956, or 45 per cent of total world output. The wholesale value of American trucks and buses built and sold during the year exceeded $2 billion.

•

The 65,000 privately owned aircraft now being operated in the U. S. will increase to at least 90,000, and the 10 million hours currently being flown by private planes each year will double by 1976.

•

The U. S. aircraft industry has already invested $100 million of its own money in new test and manufacturing facilities for the ballistic missile program and additional large expenditures are scheduled.

•

Demand for replacement passenger car tires by 1965 will reach a record-breaking 70 million units, about 17 million more than were sold in 1956, if car registrations continue to increase at the present rate.

•

Prolonged illness and absence from the job costs employes in private industry 13 per cent of their annual income—a total of $800 million in lost wages, plus personal medical expenses. Almost $2 billion in production time is lost annually from this cause.

When aluminum needs heat treating it's time to look to LINDBERG

Lindberg Cyclone batch type furnace for heat treating aluminum castings.

When your use of aluminum makes it essential to apply heat for annealing or stress relief Lindberg can come up with the right equipment to do the job. Whatever the requirement our long experience in the application of heat to all types of metal can provide you with just the right furnace to fill your specific need. Maybe the batch type furnace shown here is what you need, or a big bottom quench for treating large aluminum sheets. No matter, Lindberg's staff of engineers, metallurgists and research technicians will face up to your problem. They'll help you find the answer, too, with the right type of equipment to treat aluminum or aluminum alloys to exact requirements of your product. Just get in touch with the Lindberg plant or the Lindberg Field Representative in your locality. Lindberg Engineering Company, 2491 West Hubbard St., Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Ave., at Downey, California.

LINDBERG

heat for industry

ON OUR WASHINGTON WIRE

It's a "think big" philosophy that's finally building up in a new Washington planning for missiles, rockets, and space travel. Not only are old cut-backs being wiped out, but new projects are being authorized daily.

Government will conduct a crash program to inventory the country's pool of scientists, engineers and technicians as a first step in beefing up lagging research. Study will include comparative data on salaries, in government and industry, fringe benefits and methods of fixing salary scales. Results will be used next year in efforts to overhaul Government pay for scientific workers.

Here's what is likely to result from upcoming congressional investigations of U. S. rocket program: The armed services will be ordered to stop duplicating and triplicating each other's missile and rocket projects; tax deductions will be authorized for engineering and scientific education; more dollars will be appropriated for Federal research into missiles, rockets, and space travel; and local school boards will be urged to scrap some of the frills of "progressive education" (how to drive a car, how to select a TV program), and to reinstitute compulsory mathematics, physics, algebra.

Highest priority rating for materials in the U. S. earth satellite project is confirmed by a new Defense Dept. instruction. In it, the Pentagon authorizes the Navy to assign DX ratings to steel, copper, aluminum, and nickel alloy products for satellite work. Materials for the military missiles programs were given this priority earlier.

Senator Mike Mansfield, D., Mont., says the U. S. Government should start immediately to subsidize all science students, beginning with high school sophomores. Those qualified would have their government support continued through four years of college, and those especially gifted would continue to have their bills paid by the government in their postgraduate years.

Another railroad industry campaign to increase revenues by boosting freight rates to shippers is underway. It is highly unlikely though that advanced rates will be asked on iron and steel products. The railroads would like more money for hauling these items, but they are wary of driving more iron and steel carriage into the hand of truckers, through rate boosts.

Continuity in the field of basic research is a primary aim of the newest Defense Dept. decision on research programs. In a switch from the former policy in this field, the Pentagon is putting heavier emphasis on scientific study.

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PARTS AND COMPONENTS

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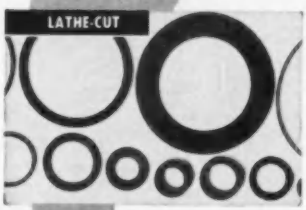

Whether your part is of complex design, or requires materials and properties to overcome severe conditions involving high or low temperatures, fluids, gases, flexing, abrasion, or friction, put Goshen Rubber to work for you. Small parts are a specialty . . . compression or transfer molded, bonded-to-metal or precision cut . . . to critical tolerances. You'll find Goshen a reliable source, too, for O-rings of compounds meeting MIL, AMS, SAE, ASTM and industrial specifications, in MS, AN, SAE, JIC and NAS standard sizes, plus many non-standard sizes and special shapes.

We'll be glad to review and quote on your needs . . . in confidence and without obligation.

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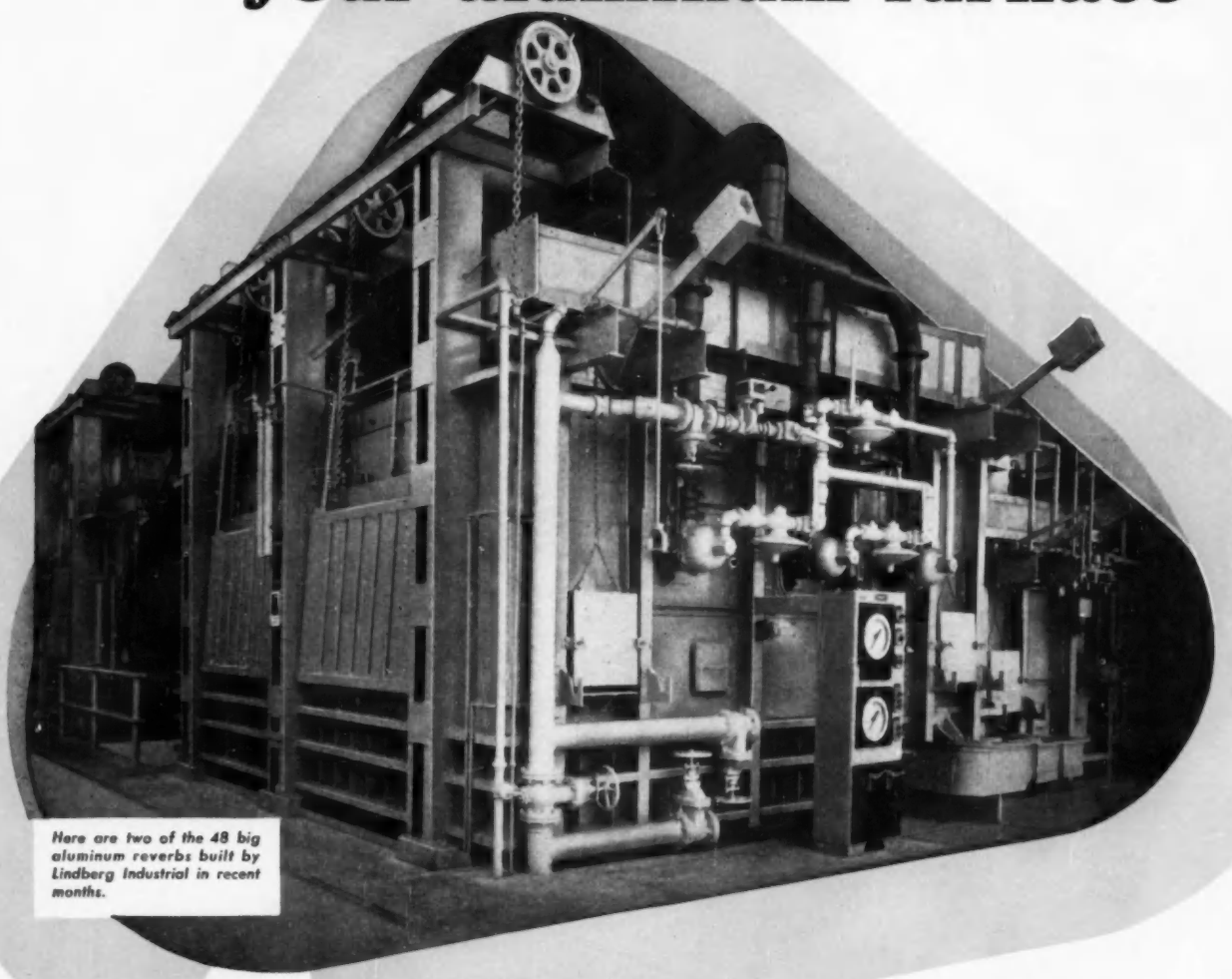
Even if it's as big as a house...

LINDBERG will field-install your aluminum furnace

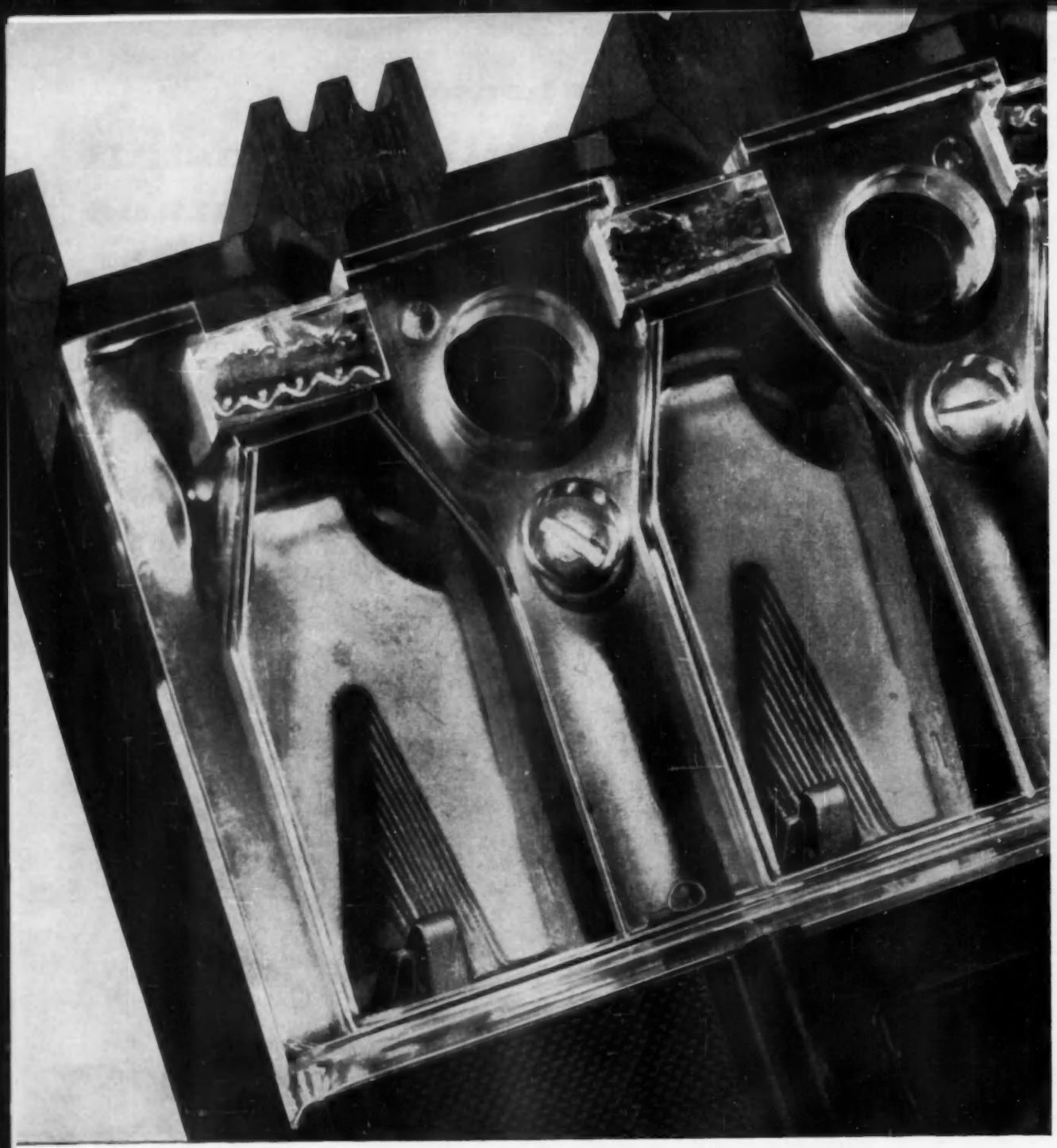


Here are two of the 48 big aluminum reverbs built by Lindberg Industrial in recent months.

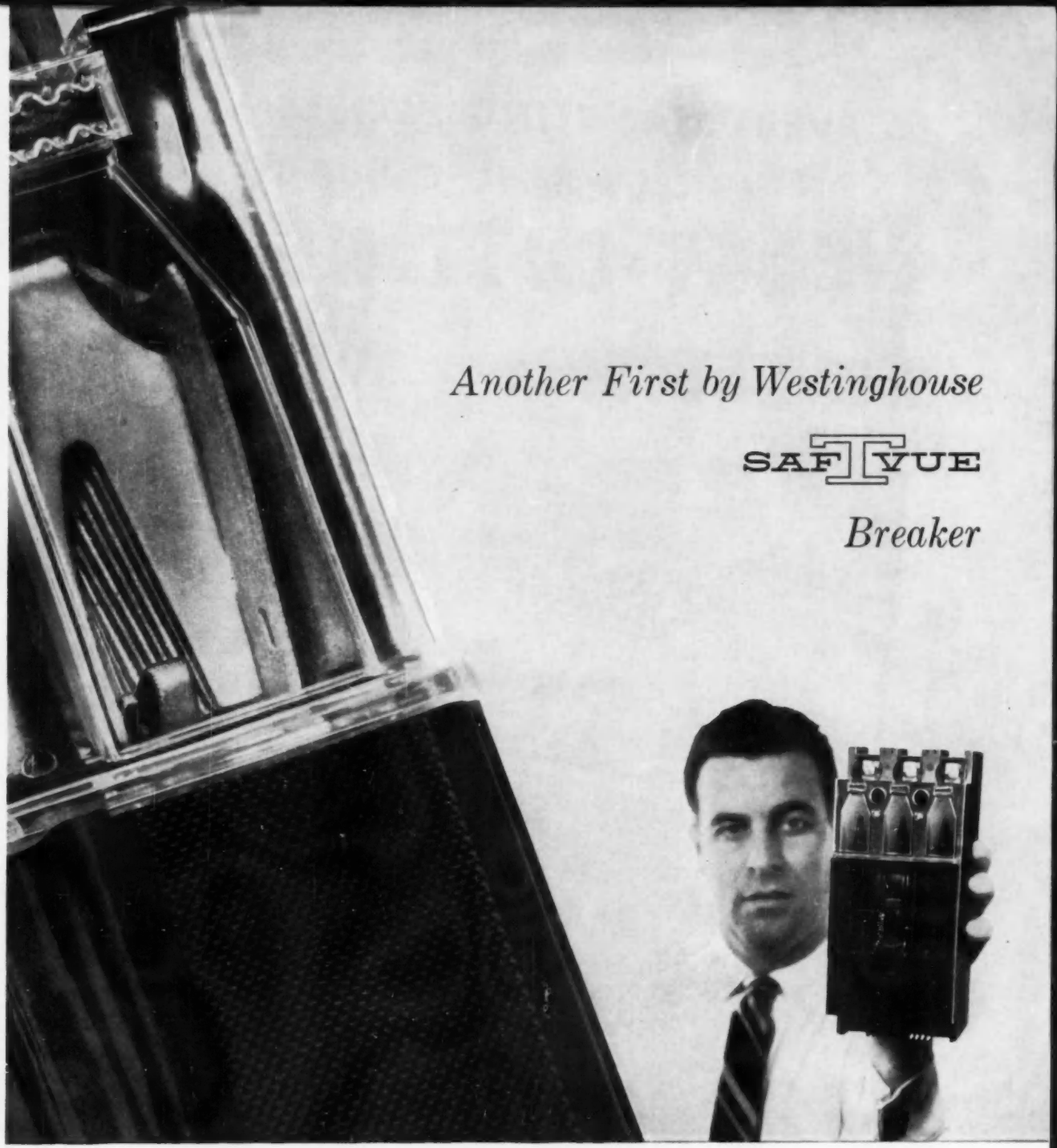
Whatever your plant needs for any application of heat to industry Lindberg will field-install it for you. A big one like the big reverb illustrated or a dozen of them, or a complete "turn-key" job of smaller units. We offer a complete service from design and engineering through actual installation including all the construction needed to fit the new equipment into your production processes.

The safest way to be sure that you have the right answer for any field-erected application of heat to industry is to talk it over with the most widely experienced experts you can find. We believe we have them here at Lindberg. Our business is concerned only with the development of industrial heating equipment and we design and manufacture the most complete line in the field; heat treating furnaces, melting furnaces, high frequency units, ceramic kilns; electric or fuel-fired, built in your own plant. Get in touch with Lindberg Industrial Corporation, 2321 West Hubbard Street, Chicago 12, Illinois, or your local Lindberg Field Representative. Los Angeles Plant: 11937 S. Regentview Ave., at Downey, California.

LINDBERG heat for industry



World's First Breaker with the Contacts VISIBLE



Another First by Westinghouse

SAF T VUE

Breaker

Everyone who's seen this exciting new development has said "this is the biggest thing in circuit protection since the development of breakers... you're sure the contacts are open (or closed) because you can see through the transparent window."

Of course they're right, and in addition, Westinghouse Saf-T-Vue Breakers have the positive action, tested accuracy, long life and special features that engineers, manufacturers, electricians and contractors have depended upon for years. Now plants whose safety codes require that contacts be visible can use the most modern form of circuit protection.

See your Westinghouse representative, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pennsylvania. J-30286

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Miller AIR CYLINDERS

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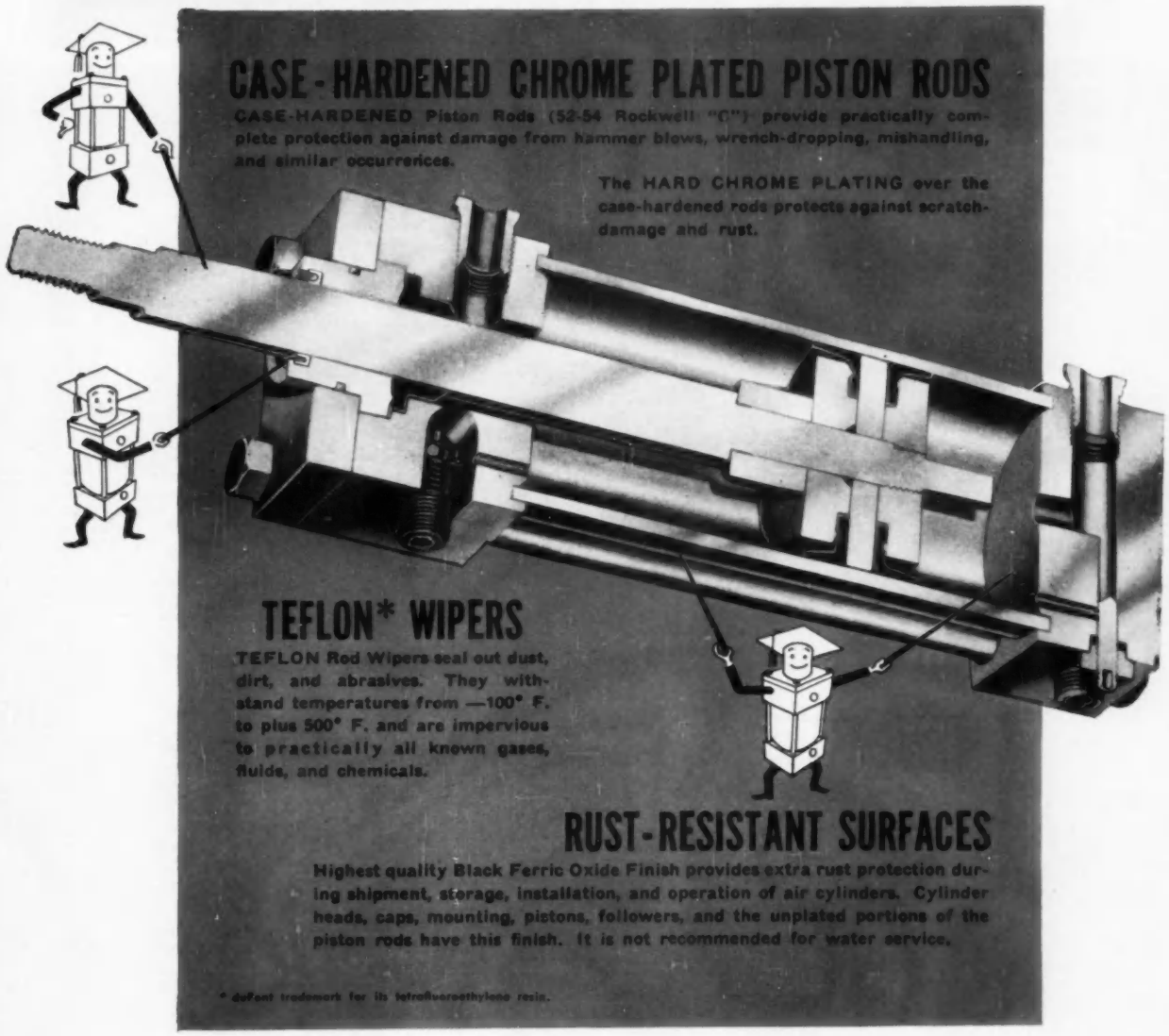

CASE-HARDENED CHROME PLATED PISTON RODS

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences.

The **HARD CHROME PLATING** over the case-hardened rods protects against scratch-damage and rust.

TEFLON* WIPERS

TEFLON Rod Wipers seal out dust, dirt, and abrasives. They withstand temperatures from —100° F. to plus 500° F. and are impervious to practically all known gases, fluids, and chemicals.

RUST-RESISTANT SURFACES

Highest quality Black Ferric Oxide Finish provides extra rust protection during shipment, storage, installation, and operation of air cylinders. Cylinder heads, caps, mounting, pistons, followers, and the unplated portions of the piston rods have this finish. It is not recommended for water service.

* duPont trademark for its tetrafluoroethylene resin.

Other Standard Miller Quality Features include: bar stock steel heads, caps, and mountings; rust-resistant brass barrels; self-regulating, wear-compensating piston rod seals that never require adjustment; space-saving square design; and other features as shown in Bulletin A-105 sent free on request.

Sales and Service from Coast to Coast . . .

Miller Air Cylinders are available in 1½" through 20" bores for 250 psi operation. Select from 19 standard mountings, strokes up to 22 feet, single and double rod end, cushioned and non-cushioned, and over-size rod cylinders. Large selection for immediate delivery.

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compact . . . power packed

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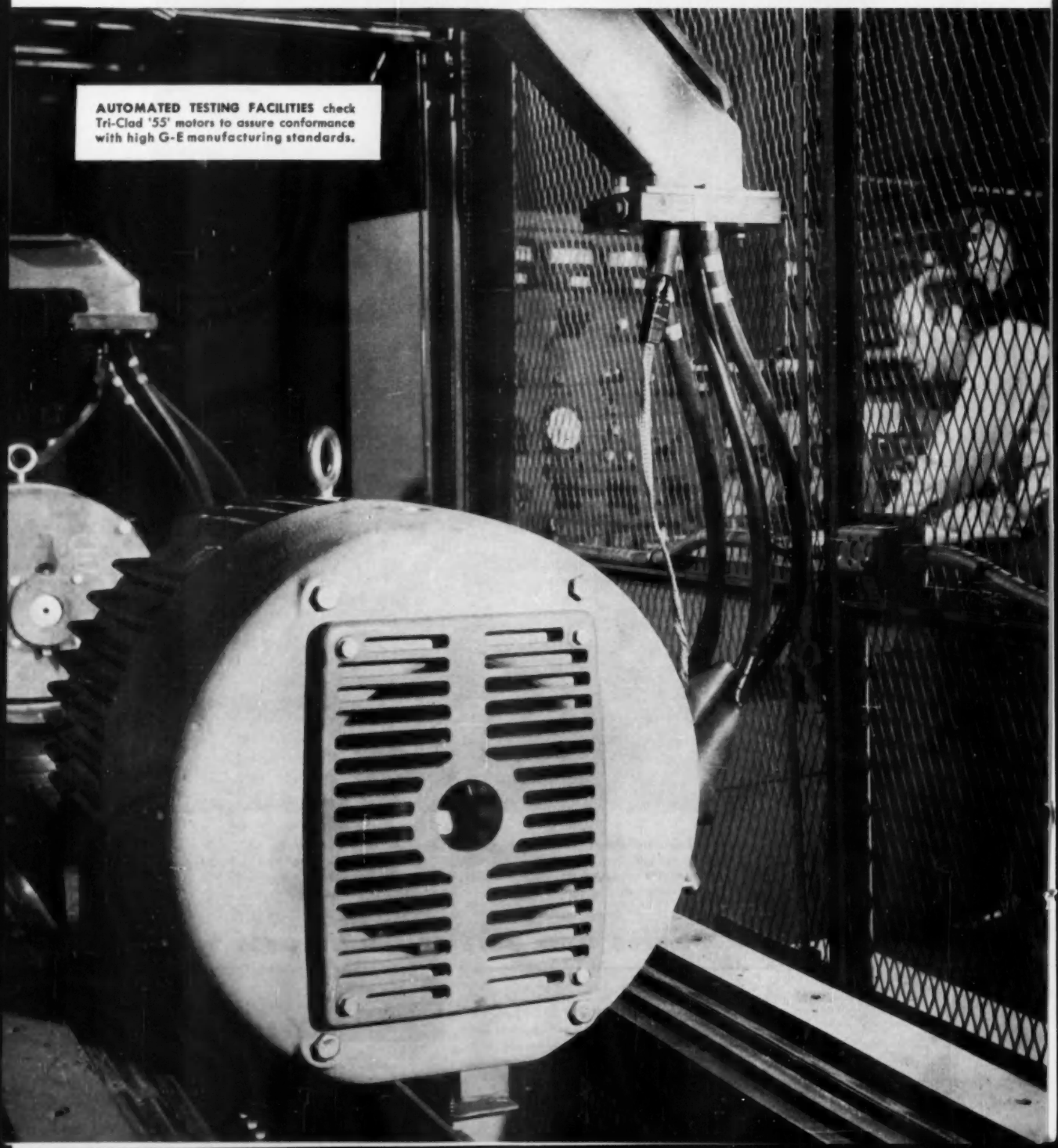


AUTOMATED TESTING FACILITIES check Tri-Clad '55' motors to assure conformance with high G-E manufacturing standards.

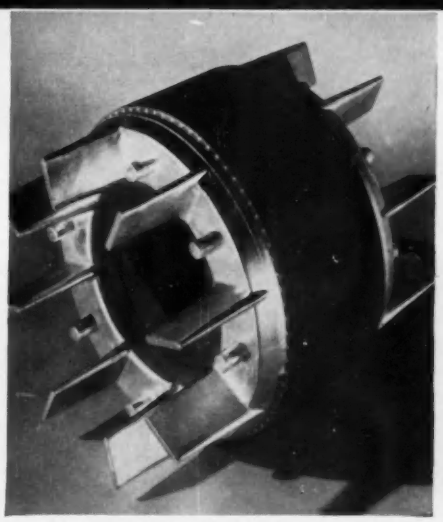
TRI 55 CLAD Motors Offer . . .

REG. U.S. PAT. OFF.

RELIABILITY

NOW AVAILABLE THROUGH 125-HP

MORE EFFECTIVE INSULATION—New Mylar® polyester film slot and phase insulation gives Tri-Clad '55' stators up to 8 times more protection than conventional types. Formex® wire gives protection against heat aging.



MORE EFFICIENT ROTORS—Revolutionary new double-entrance centrifugal casting technique is utilized on rotors for new larger ratings—up through 125-hp. Solid castings result, helping to prevent localized heating.

MORE FULLY PROTECTED ENCLOSURES—Tri-Clad '55' motor frames and end-shields are cast-iron constructed to provide rigid support and corrosion resistance. Cast-in louvers help protect against contaminant entrance.

immediate shipment . . . all ratings

To cost-conscious motor users, greater equipment reliability means both immediate and long-run cost reductions. In the immediate future, it minimizes profit-robbing downtime and cuts maintenance costs; and, in the long-run, it reduces replacement costs because motors last longer.

Now, to provide increased reliability for motor users, General Electric offers a complete line of Tri-Clad '55' motors—up through 125-hp—designed to new NEMA space and weight-saving dimensions.

QUALITY CONSTRUCTION GIVES GREATER RELIABILITY—New materials and manufacturing techniques—such as those described above—are used in the production of Tri-Clad '55' motors to give added service life, with fewer breakdowns and reduced maintenance.

But, greater reliability is not the whole Tri-Clad '55' motor story. G-E engineers have also designed these new motors to provide easier installation, and reduced shipping, handling and storage costs. And, you can get ***immediate*** shipment—usually from warehouse stocks—of any popular Tri-Clad '55' motor rating, up through 125-hp.

FOR COMPLETE INFORMATION on the new line of Tri-Clad '55' motors, contact your nearby G-E Apparatus Sales Office or Distributor. Send in the attached coupon for free Tri-Clad '55' motor bulletins.

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Section B891-9
GENERAL ELECTRIC COMPANY
Schenectady 5, New York

Please send me the following publications:

☐ **FREE BULLETIN (GEA-6602) describes advanced features of new Tri-Clad '55' motors through 125-hp.**
☐ **FREE SLIDE RULE (GEN-148) to determine weight and space-saving benefits of new Tri-Clad '55' motors.**

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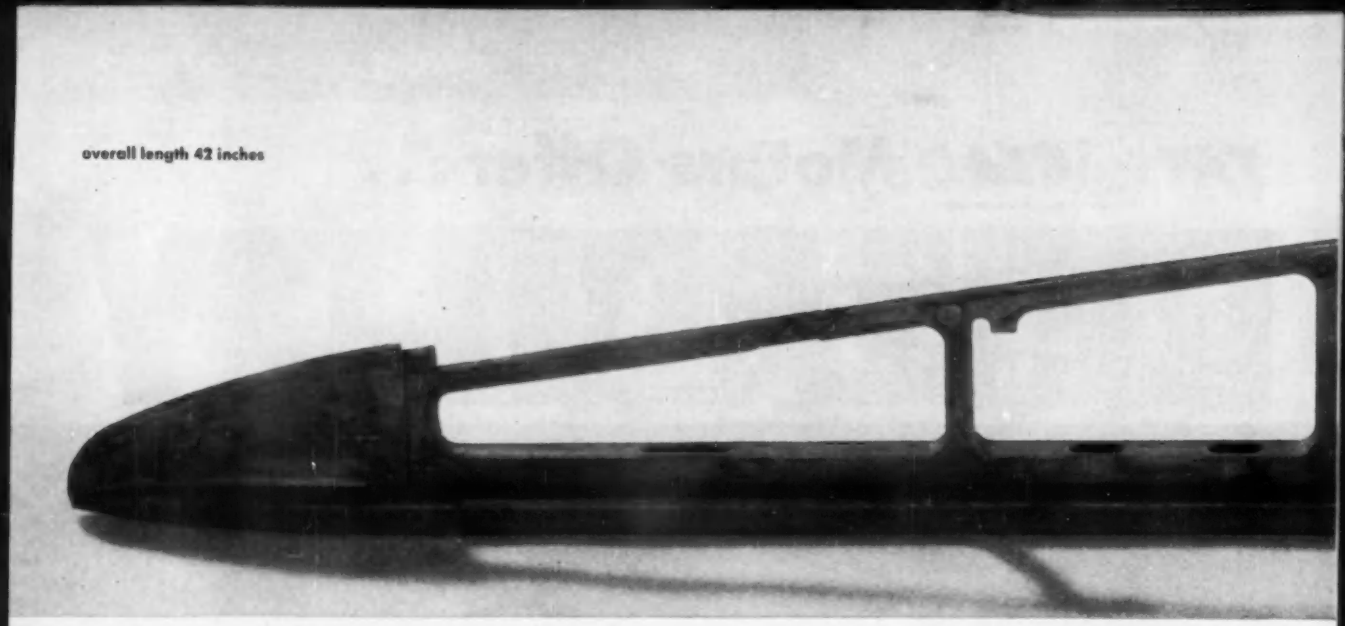
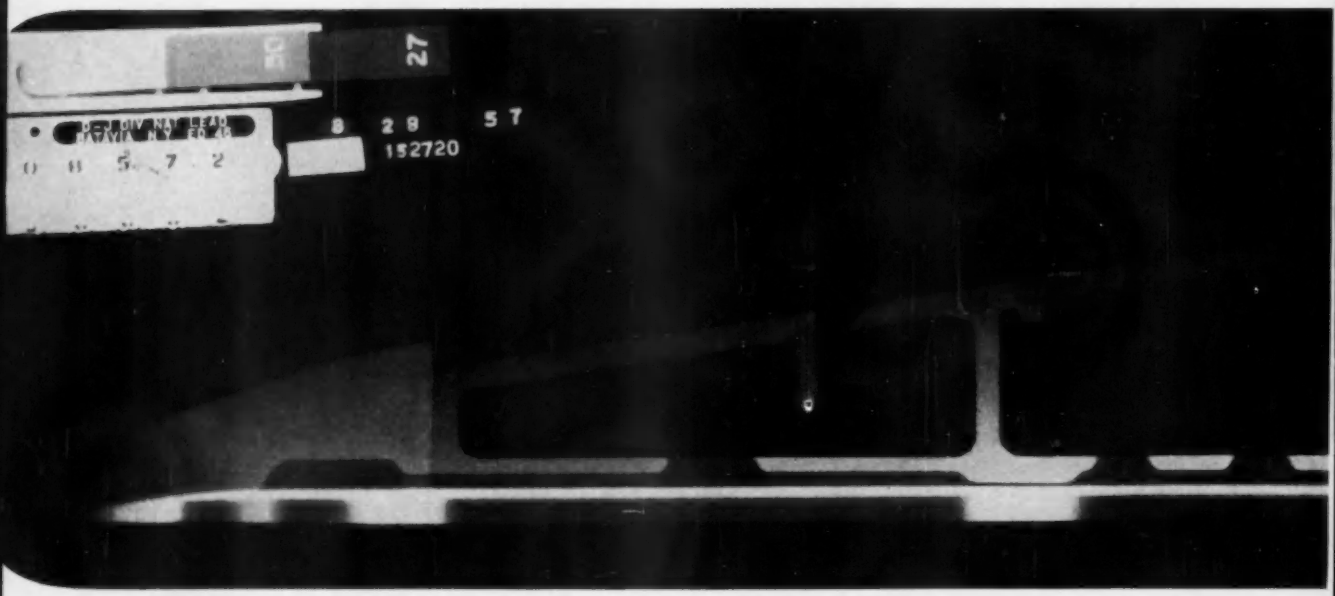
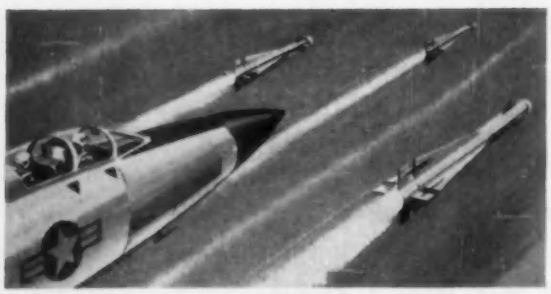


Now...from Doehler-Jarvis...die castings



X-ray of the Falcon's fin proves



The Falcon is an air-to-air missile built by Hughes Aircraft Company for the U. S. Air Force. Its light weight die cast stabilizer fins resist severe strain during course changes. It uses other Doehler-Jarvis die castings also.

Now *you* can have structurals die cast to standards as high as those for primary aircraft structurals*.

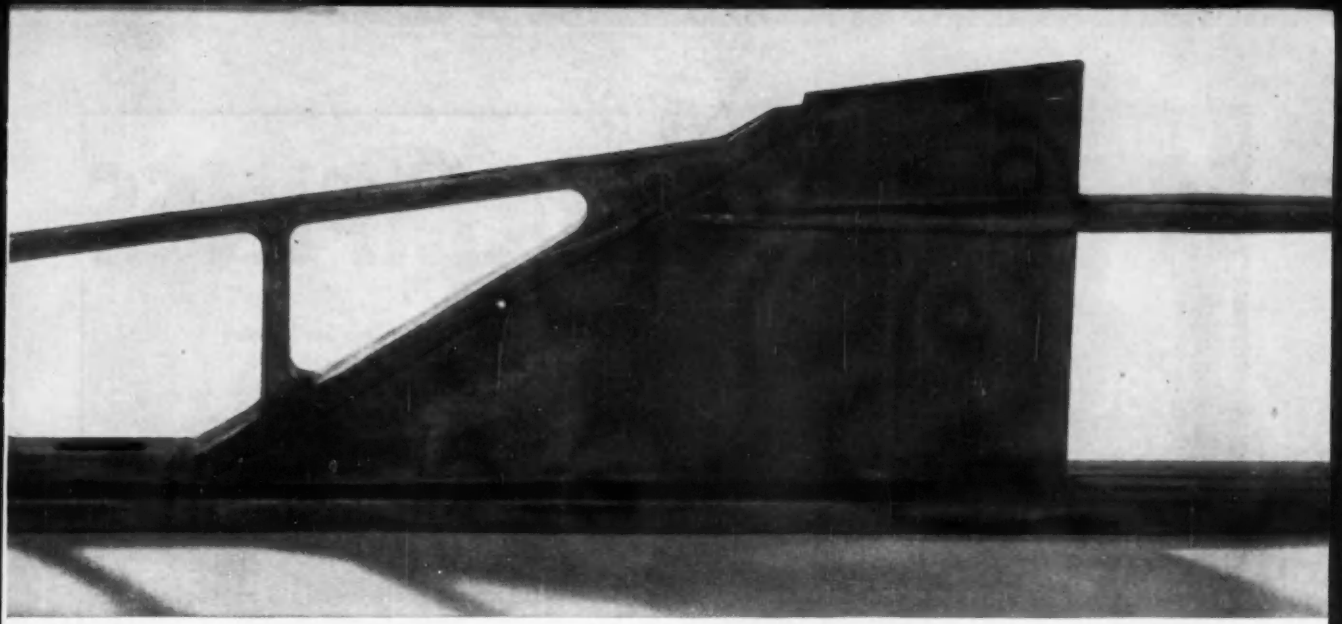
Die cast! With all the economy, precision, surface superiority, ease of assembly that implies. Die cast of aluminum, or of a high-purity magnesium alloy, like the 42" Falcon stabilizer fin.

They said it couldn't be done!

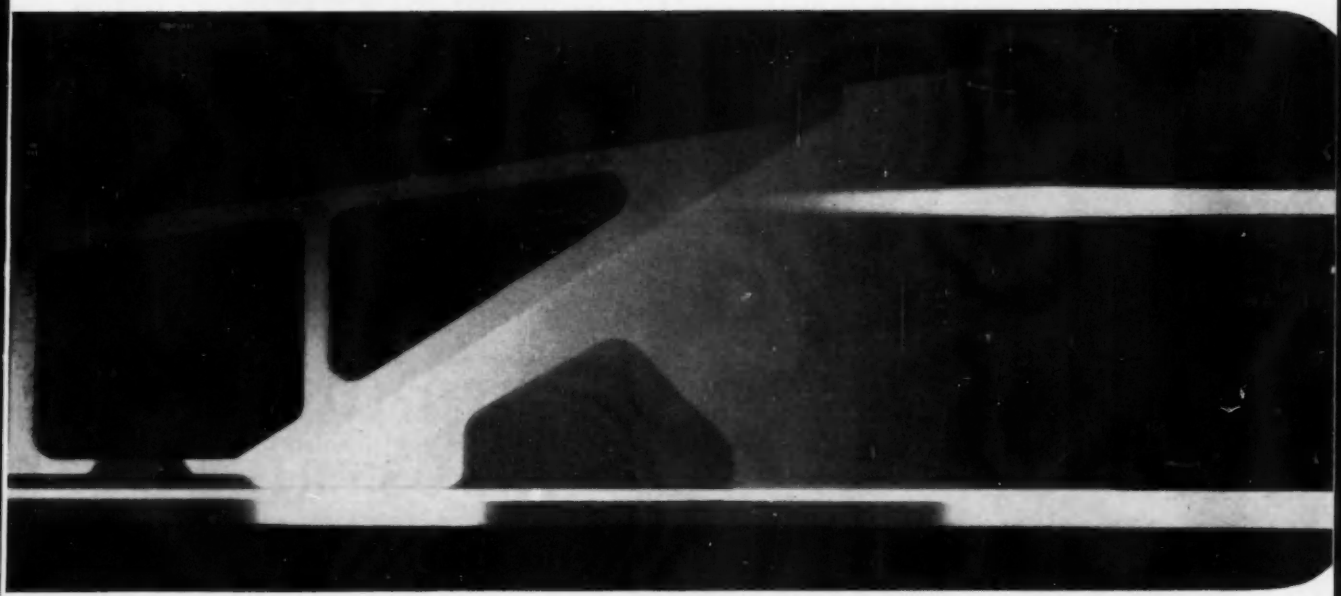
But there you see such a structural! Along with X-ray proof of soundness, uniformity, primary-aircraft-structural* quality.

Mind you! The Falcon fin is in commercial production. Doehler-Jarvis has die cast thousands. Each has had to pass 73 inspections before acceptance . . . including 100% X-ray.

In *one* control, sections of castings are continuously tested for tensile strength. In this examination of physical properties, the castings normally exceed tensile specifications by 15% or



# of primary-aircraft-structural* quality



their uniformity and soundness

more. Quality is so high there has never been a single test below specification.

How did this come about?

Like many developments in die casting, this one started with a customer's need . . . Hughes Aircraft's.

They, and the Armed Services, needed such castings. The parts *might* be made other ways. But at what cost! What sacrifice in weight — and materials! If it *could* be die cast, if there *were* a magnesium alloy able to stand supersonic air stresses . . .

It took a while. But, with close cooperation from engineers of both Doehler-Jarvis and Hughes, the way was found.

Now you can list die castings of primary-aircraft-structural* quality among D and J availabilities. Get them from any Doehler-Jarvis plant.

*A primary aircraft structural is a major load-bearing component member any single failure of which would result in loss of the aircraft.

Doehler-Jarvis

DIVISION OF NATIONAL LEAD COMPANY

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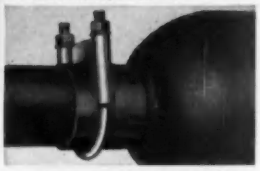

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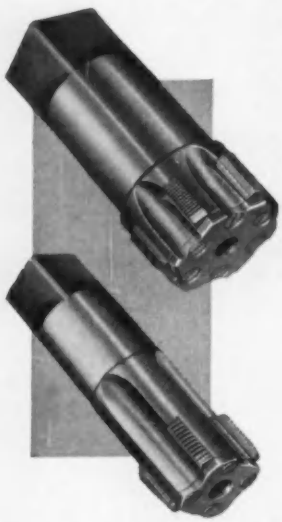

Chasers of any P.D. are standard for the Murchey Adjustable Tap. After chasers have been reground a number of times, new chasers can be purchased at a fraction of the cost of a solid tap. Chasers of any specific size, can be adjusted oversize or undersize for different fits.

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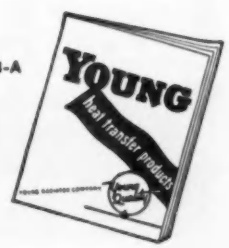

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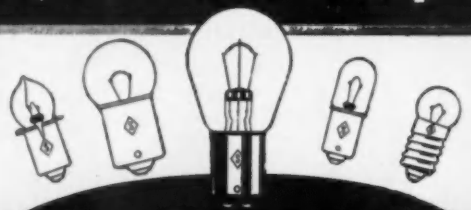

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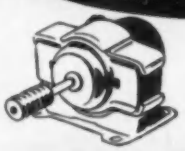

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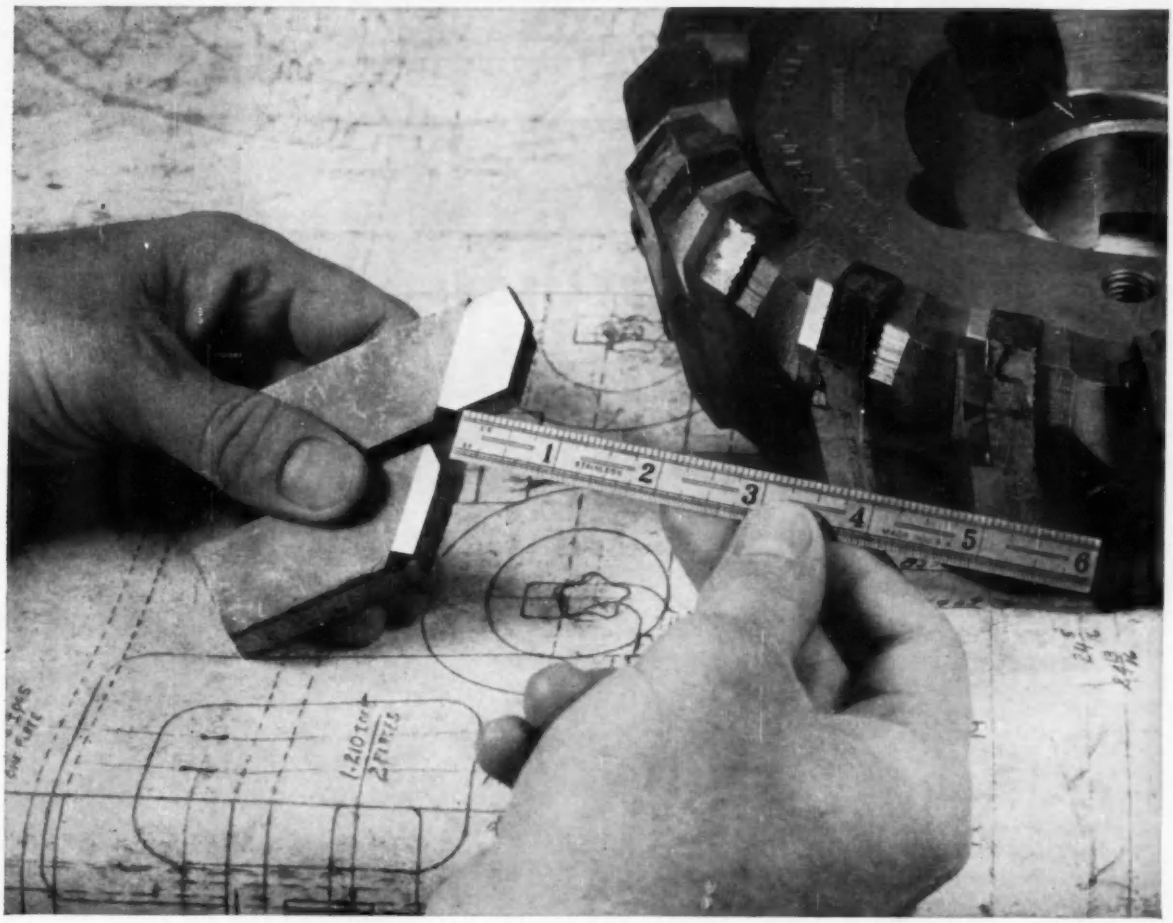

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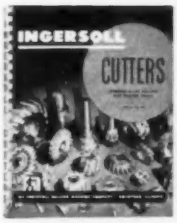

If you do not have a copy of this book, write us and we will send you one. It describes in detail the complete line of Ingersoll inserted blade milling and boring tools. Ask for Catalog #66I

CUTTER DIVISION

THE INGERSOLL MILLING MACHINE COMPANY

505 FULTON AVENUE — ROCKFORD, ILLINOIS

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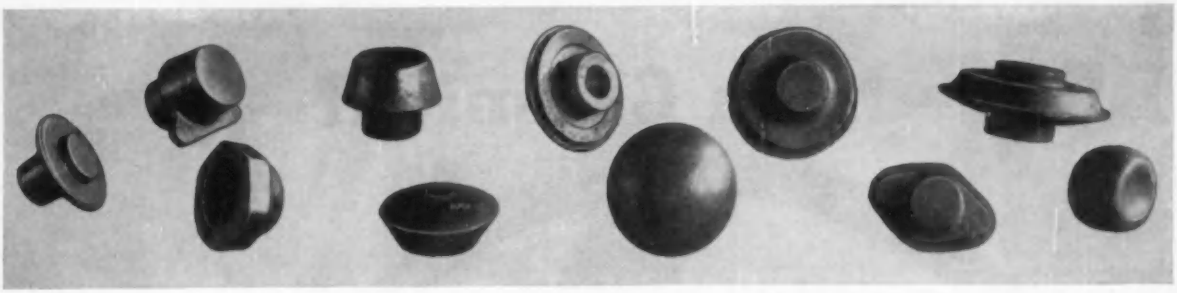
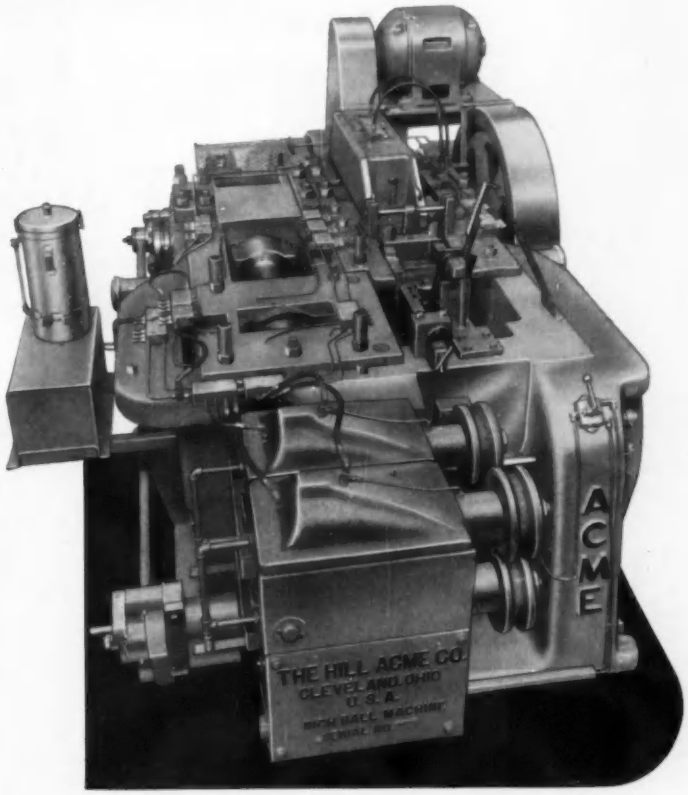


Typical Shapes Produced by ACME Single Blow Forging Machines

SINGLE BLOW FORGINGS
AT 135 PER MINUTE

● One man operating this ACME single blow solid die forging machine is producing 135 one inch hard steel balls per minute from 11/16" stock. Automatic feed rolls carry bar stock at proper speed for maximum efficient operation. Adequate safety devices prevent jamming of the die.

ACME solid die forging machines are rated according to the size ball they will forge. Machines are built from 1" to 5" capacity.



Complete information is given in Bulletin SB-57.

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News about

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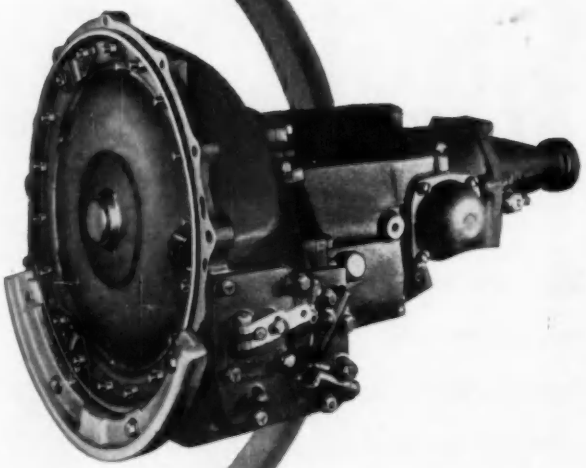
HYCAR 4021 RUBBER

resists sulfur-bearing, extreme-pressure lubricants at high temperatures



MANY of the oils used in automobile and truck automatic transmissions are designed for high pressure service and contain sulfur-bearing additives to protect the oil. Unlike conventional oil-resistant rubbers, Hycar 4021 is *not hardened* by sulfur-bearing oils. Vulcanized parts of this material maintain flexibility throughout their life in this service.

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Hycar 4021 is one of many types of special purpose rubbers furnished in raw material form and available now. For further information write Dept. HJ-6, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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FORT WAYNE, INDIANA

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